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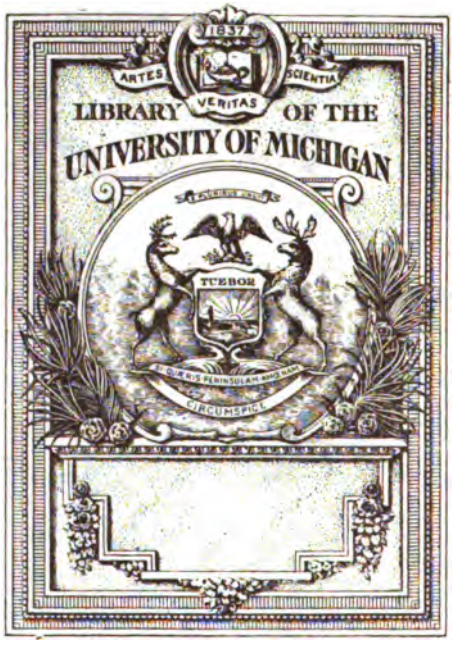
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TRANSACTIONS

OF THE

Fifteenth International Congress on Hygiene and Demography

WASHINGTON

September 23–28, 1912

PUBLISHED BY THE COMMITTEE ON ORGANIZATION

EDITED BY THE SECRETARY GENERAL

VOLUME I

PART I.—Organization and Membership; Opening and Closing Sessions; Proceedings of the Permanent International Commission; Reports of the Secretary General and the Director of the Exhibition.

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DR. WALTER M. COLEMAN.
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Burlington—Dr. Frederick E. Clark.
Rutland—Dr. C. F. Ball.

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Lynchburg—Dr. Mosby G. Perrow.
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Dr. Lawrence T. Royster.
Dr. Stark A. Sutton.
Portsmouth—Dr. Joseph Grice.
Richmond—Mr. A. H. Straus.
Roanoke—Dr. W. Brownley Foster.

WASHINGTON.

Dr. Eugene R. Kelley.
Dr. Elmer E. Heg.
Dr. J. E. Crichton.
Dr. Thomas Tetreau.
Dr. J. W. Bean.
Dr. Albert P. Duryee.
Dr. Wilson Johnston.

Bellingham—Dr. Edward C. Ruge.
North Yakima—Dr. Thomas Tetreau.
Seattle—Dr. James Crichton.
Dr. A. A. Braymer.
Spokane—Dr. John B. Anderson.

WEST VIRGINIA.

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Dr. Oswald O. Cooper.
Dr. Lewis van G. Guthrie.
Dr. Wm. W. Tompkins.
Dr. John N. Simpson.

Elkins—Dr. Hoddie W. Daniels.
Parkersburg—Dr. Lonzo O. Rose.
West Virginia State Medical Association—
Dr. Tom A. Williams.

WISCONSIN.

Dr. C. A. Harper.
Hon. J. D. Beck.
Mrs. Julia Kurtz.
Dr. T. L. Harrington.
Dr. Hugo C. Reich.

La Crosse—Dr. Jacob M. Furstman.
Milwaukee—Dr. George P. Barth.
State Federation of Women's Clubs—
Dr. Bertha V. Thomson.

WYOMING.

Dr. Anna G. Hurd.
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Columbia University—Dr. Phillip Hanson Hiss.
Cornell University—Dr. Graham Lusk, Dr. Warren Coleman, Dr. S. Erdman, Dr. C. N. B. Camac, Dr. L. H. Bailey.
Johns Hopkins University—Dr. W. S. Thayer.
Lehigh University—Henry Sturgis Drinker, E.M., LL. D., Dr. W. L. Estes.
New York University—Chancellor Elmer E. Brown, Dr. Hermann M. Biggs.
Princeton University—Prof. J. E. Raycroft, Dr. Stewart Paton.
Stanford University—Prof. Royce R. Long.
Tulane University—Dr. Creighton Wellman.
Valparaiso University—Prof. Henry B. Brown.
Western Reserve University—Dr. Roger C. Perkins.
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University of Colorado—Prof. Francis Ramaley.
University of Iowa—Prof. Henry Albert.
University of Maine—Dr. Raymond Pearl.
University of Michigan—Dr. Victor C. Vaughan, Prof. Frederick G. Novy.
University of Minnesota—Prof. Frank F. Wesbrook.
University of Montana—Prof. J. Howard Stoutmeyer.
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University of Pennsylvania—Dr. A. C. Abbott, Dr. Wm. Easby, Jr., Dr. D. H. Bergey.
University of Pittsburgh—Prof. Samuel Black McCormick, Prof. Thomas Shaw Arbuthnot.
University of Syracuse—Prof. Charles W. Hargitt.
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University of Wisconsin—Prof. L. E. Reber.
University of Wooster—Wm. Estabrook Chancellor.
Amherst College—Prof. Paul C. Phillips.
Benedict College—Rev. B. W. Valentine.
Bowdoin College—Prof. Frank Nathaniel Whittier, A.M., M.D.
Massachusetts Institute of Technology—Prof. William T. Sedgwick, Prof. Selskar M. Gunn.
Medico-Chirurgical College of Philadelphia—Prof. J. Hamilton Small.
Normal College of New York—Dr. Margaret B. Wilson, Miss Clara Byrnes.
Oberlin College—Prof. A. B. Wolfe.
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American Academy of Political and Social Science—L. S. ROWE, Ph. D.

American Association for the Advancement of Science—DR. L. O. HOWARD, DR. JOHN J. R. MACLEOD.

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American Society for Tropical Medicine—DR. GEORGE DOCK, DR. CREIGHTON WELLMAN, DR. HENRY J. NICHOLS.

American Therapeutic Society—NOBLE P. BARNES.

Association of American Physicians—DR. A. C. ABBOTT, DR. F. G. NOVY, DR. M. J. ROSENAU.

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National Association for the Study and Prevention of Tuberculosis—Dr. Robert H. Babcock, Mr. Wm. H. Baldwin, Dr. W. Jarvis Barlow, Mr. Ernest P. Bicknell, Dr. E. R. Baldwin, Dr. Hermann M. Biggs, Dr. V. Y. Bowditch, Dr. T. D. Coleman, Dr. Thomas A. Darlington, Dr. Livingston Farrand, Dr. Henry B. Favill, Dr. Lawrence Flick, Mr. Homer Folks. Dr. John S. Fulton, Mr. John M. Glenn, Dr. C. Walter Holden, Dr. John N. Hurty, Dr. Henry B. Jacobs, Dr. S. A. Knopf, Dr. John H. Lowman, Dr. Rudolph Matas, Dr. Charles L. Minor, Dr. Mazyck P. Ravenel, Dr. Theodore B. Sachs, Dr. E. C. Schroeder, Gen. George M. Sternberg, Dr. Victor C. Vaughan, Dr. Wm. H. Welch, Dr. Wm. Charles White, Mr. Alexander M. Wilson.

National Association for Study and Education of Exceptional Children—Maximilian P. E. Groszmann, Ph. D., Dr. A. Emil Schmitt.

National Dental Association—Dr. E. A. Bogue, Dr. Homer C. Brown, Dr. S. P. Cameron, Dr. J. P. Corley, Dr. W. G. Ebersole, Dr. W. Smith Frankland, Dr. J. A. Gorman, Dr. A. C. Hawley, Dr. Perry McCullough, Dr. B. Holly Smith, Dr. Burton L. Thorpe, Dr. Wm. Ernest Walker.

National Educational Association—Mr. Leonard P. Ayres.

National Housing Association—Mr. Robert W. de Forest, Mr. John Ihlder.

National Ice Association—Mr. John C. Sparks.

Illuminating Engineering Society—E. B. Rosa, Walter C. Allen.

Playground and Recreation Association of America—Joseph Lee.

Prudential Insurance Company of America—Charles W. Crankshaw, M.D., D.D.S.

General Federation of Women's Clubs—Dr. Frances L. Bishop.

International Harvester Company—Mr. Clarence J. Hicks.

North China Medical Missionary Association—Dr. John J. Mullowney.

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FIRST PLENARY SESSION.

OPENING OF THE FIFTEENTH INTERNATIONAL CONGRESS ON HYGIENE AND DEMOGRAPHY.

The opening session of the Fifteenth International Congress on Hygiene and Demography was held in the auditorium at Continental Memorial Hall on Monday morning, September 23, in the presence of a large and distinguished assembly. The president of the congress, with the representatives of the Federal government, the official delegates of participating countries, and the officers of the sections entered the stage from the museum at half-past ten o'clock.

The president, Dr. Henry P. Walcott, called the congress to order and announced the following additional officers of the congress:

HONORARY PRESIDENTS.

William Howard Taft, President of the United States.
Prof. August Gaertner, Jena, Germany.
Prof. Axel Holst, Cristiania, Norway.
Dr. Eduardo Licéaga, Mexico City, Mexico.
Dr. Vicente Llorente, Madrid, Spain.
Prof. Friedrich Loeffler, Greifswald, Germany.
M. Directeur Lucien March, Paris, France.
Sir Thomas Oliver, Newcastle-on-Tyne, England.
Prof. L. Pagliani, Turin, Italy.
Prof. Wilhelm Prausnitz, Vienna, Austria.
Dr. M. W. Pijnappel, Zwolle, Holland.
Prof. Max Rubner, Berlin, Germany.
Prof. Artur Schattenfroh, Vienna, Austria.
Prof. Ferencz Tangl, Budapest, Hungary.
Dr. Simon von Unterberger, St. Petersburg, Russia.

VICE PRESIDENTS OF THE CONGRESS.

Surg. Gen. Rupert Blue and Dr. Hermann M. Biggs.

The President of the United States,[1] the honorary president of the congress, addressed the congress as follows:

[1] Owing to unavoidable delay, the President was unable to be present as expected at the moment of opening. The address of President Walcott preceded that of the President.

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ADDRESS OF THE PRESIDENT OF THE UNITED STATES.

It is my pleasant and honorable duty, on behalf of the people and the Government of the United States, to welcome this great congress to Washington.

"Prevention is better than cure." The science of medicine and surgery has made wonderful growths in the last 40 years, but in that time it would seem as if the science of sanitation, of hygiene, and of preventive medicine had come into being from nothing. And now the two, prevention and cure, through the intense energy, industry, application, keen discrimination, and high and enthusiastic aims of the benefactors of human kind, who are now devoting their lives to research and the investigation of the cause of disease, its transmission and its antidotes, are proceeding, pari passu, with such rapidity and success that in the next century we may almost expect to find the equivalent of that fountain of youth and perpetual life which was sought for in this country by some of the early discoverers.

It is easy to make an error with reference to the beginning of a great forward movement by dating it from the time when the would-be historian has become alive to its progress and convinced of its importance. Now, I do not mean to say that our sanitary science in this country began with the Spanish War; I do not mean to say that it had its origin in the Tropics; for I have no doubt that nearly every one who hears me could confute such statements by reference, for example, to the robbing of dread diphtheria of its terrors by antitoxin and other similar revolutionary discoveries. And yet it is true that out of a war, very short of duration and of comparatively little importance in the number of men engaged, and the cost, and the lives lost, there came to this country a series of problems, the most important of which included questions of sanitation, the methods of transmission and the cure of tropical diseases, the adoption and enforcement of a system of hygienic law, and the establishment in the Tropics of governmental institutions of medical research by Army, Navy, and civilian physicians which have brought to the

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attention of the whole country the necessity for widespread reform in our provisions for the maintenance of health and the prevention of disease at home.

Our responsibilities in Cuba, Porto Rico, and the Philippines, and now on the Isthmus of Panama, have so enlarged our knowledge of the possibilities of successful sanitation under the most burdensome conditions, and have so impressed both professional men and the laymen at all familiar with conditions with the necessity for more rigid and comprehensive health laws, and a stricter enforcement of them for the general public good, that if the Spanish War resulted in nothing else, it was worth greatly more than it cost in this useful development of one of the most important functions that modern government has to discharge, as well as in making clear the need of an additional branch of general education in the matter of the hygiene of the home and of the individual.

It would seem as if the Tropics were the proper place for the beginning of a crusade on this subject. In the Tropics nature has a more rapid growth not only in vegetation and in animal life, but the diseases are shown on a larger scale and permit the study of their development with more certainty of conclusion than in the Temperate Zone. The effect of preventive regulation upon great bodies of persons is more clearly marked and the reward for hygienic strictness seems greater and more obvious. When we first went into the Tropics our purpose was to make that region habitable for white people. We have demonstrated that as a possibility. Now we have gone beyond the provision for those who come from the Temperate Zone and we are engaged in the work of developing the tropical races into a strength of body and freedom from disease that they have never had before. The prevalence in a whole race of the hookworm, or of malaria, or of beriberi, the persistence in the intestines of an entire population of many varieties of disease germs which do not destroy but weaken and stunt and shorten life, shows the possibility by proper health methods and proper treatment of revitalizing tropical races and securing from them that vigor of physical action which will enable them to develop and enjoy the marvelous richness of the countries in which they live. Of course the problem of enforcing health regulations against the will of an ignorant people, whose natural laziness and resentment at discipline makes the enforcement most difficult, requires a strong government and the

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raising of a sufficient fund by taxation to maintain an adequate health police. These are the problems in the Tropics that every Government that has dependencies must meet. There is no difficulty about running a government cheaply if you limit its functions to the mere matter of the preservation of peace and the administration of justice; but if you propose to add to these adequate systems of education, government hygiene, good roads, and other internal improvements, then you must look about for sources of revenue which are not always forthcoming, and an absence of which retards the progress that every good administrator longs for in the interest of the people intrusted to his charge. And then if the government to be established is to be more or less popular the people themselves must be educated to understand the importance of the hygienic restrictions, to accept them, and themselves to impose upon themselves the burden of taxation which it is essential for them to carry in order that any progress shall be made at all.

I consider it a proud record of the American Army that through its Medical Corps engaged in hygienic work so many important discoveries as to the transmission of disease and the method of stopping its spread have been given or proven to the world, and all of this is dated chiefly from the time of the Spanish War. The elimination of black smallpox by thorough vaccination; the study of bubonic plague, its mode of transmission, suppression of its causes, and its methods of treatment; the study of cholera and its method of treatment, together with the preventive inoculation; the study of beriberi and the methods of its prevention and cure, which have not even as yet been altogether satisfactory; the learning of the causes of yellow fever by transmission through the mosquito and its method of treatment so as, by isolation of both the patient and the mosquito, to prevent its spread in a community and its ultimate suppression; the minimizing of the bad effects of malaria by the destruction of the mosquito which carries its poison; the ridding a race of the hookworm and its demoralizing physical degeneration; the prevention of typhoid by inoculation; all constitute great steps forward in the treatment of diseases that, though most of them are especially formidable in the Tropics, are general also in the Temperate Zone; and in these discoveries which have been made it is most satisfactory to be able to say that our American physicians have taken and are taking a most important and honorable part. It is very certain that

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but for these discoveries the construction of the Panama Canal, which now since 1904 has been going on with giant strides and which will be completed within a year, would have been impossible. The effort of the French to build a much smaller canal at the same place would doubtless have been successful but for the problems of hygiene, which the science of that day did not enable them to solve. And now it is proper that the chief health officer in charge of that strip 40 miles long by 10 miles wide, who has enabled 50,000 people to live there in health and build the canal, should share with the chief engineer the honors when the end shall crown the work. It was most fortunate in working out the problems that these agents of health on the Isthmus had no limitation put upon them with respect to expense and that everything was at their hand to accomplish the purpose of the Nation. Other problems which shall arise in the future may not be so fortunately circumstanced, and economy and the limitations of expense may call attention to the necessity for finding changes in method which shall reduce the cost of the work and bring it within reasonable figures, but it is well that the first effort was not hampered by such considerations. Of course while the great problem was the problem of the maintenance of the healthfulness of the Isthmus during the construction of the canal, there still remains the important one of keeping the strip healthful while the canal is operated.

The possibilities of improvement through governmental hygiene of tropical countries are so great that it makes one who has any conception of what they are grow enthusiastic in the contemplation of what centuries may bring forth in this regard. Of course one of the things that will have to be brought about is effective and efficient government in the Tropics, and how this is to be reconciled with the growing tendency toward more and more popular government is a question of the education of the people in governmental responsibility. Still the amount which can be done in the enforcement of principles of hygiene with the tropical races and with those who live in the Tropics has already had sufficient demonstration to make one with any imagination at all anxious to look forward to the development of the world around its middle after the Temperate Zone shall have been occupied to such an extent as to make the enterprising of their inhabitants look elsewhere for migration and settlement. The mere matter of the improvement of people in the

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Philippines by the establishment in each village of artesian wells, so as to give them pure water, gives such a marked decrease in the mortality and such a marked increase in the health of the inhabitants as to show a present condition that is capable of wonderful amendment.

I have dwelt at length upon the tropical hygiene because my responsibilities have brought me more into contact with that than with the hygienic problems of the Temperate Zone, where improvement in conditions is necessarily less marked, because the conditions are not so deplorable when attacked. The range covered by the considerations of this congress is so wide as to be almost bewildering, and the problems which are presented in working out the improvements toward the ideals that are presented are of course most various and most complicated. The question of the interference with personal liberty through the insistence upon the enforcement of health regulations does not present itself in the Temperate Zone so often as in the Tropics, because the prevalence of infectious and contagious diseases in the form of an epidemic is not so great; and yet, as we go on to regulate how people shall live, we may expect to find, as indeed we have already found, considerable resistance and inertia that requires care and caution in the drafting of drastic regulatory provisions. Then the expense of the maintenance of a force sufficient to carry out useful regulations is a most serious question in carrying on a proper government. The number of things that the Government has to do has increased so rapidly under the modern view that the necessity for economy in administration was never greater, while the burden of taxation continues and must continue to increase.

I do not doubt that we are beginning a new epoch in humanity's history in this country in reforms looking to the bodily health of those less fortunately circumstanced in their life's condition and work. The study of vital statistics showing the prevalence of diseases and tracing their causes must prompt the organized effort of governmental forces to minimize the causes, and to furnish remedies for the evil. We have already begun the reform, in our pure food law, in our Mining Bureau, and our Children's Bureau.

We must initiate investigations into diseases of particular occupations with a view to regulation or prohibtion. An example of this we have in the heavy tax upon the making of white sulphur matches.

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Still greater opportunties for improvement are before us. We need to develop under governmental auspices a bureau or a department in which the funds of the Government shall be expended for research of every kind useful in the practice and enforcement of hygiene and preventive medicine. That something of this sort may grow out of the present United States Public Health Service there is reason to believe, but it will need far greater appropriations and a widening of its scope of duties before it shall have filled the place that the medical profession of this country has a right to expect the General Government to create in the progress of hygiene and demography.

I have said little or nothing about the vital statistics, not because I would minimize its importance, but because my information in respect to it is so faulty. I am very certain that we are far behind other countries in the completeness of our vital records, because we are a new country, and we have not stopped to make the needed register of lives and deaths and diseases, and in the hurry of our existence we have failed to appreciate the enormous value that attaches to such statistics in the study of improving methods and the ascertainment of facts essential in the development of hygienic science.

I can not conceive any congress of a more useful character than the one which it is now my honor to welcome. It is useful, first, because a comparison of the ideas and the discoveries and the theories of men engaged in the same hunt for truth, and in the same delving into the mysteries of nature, with a view to wresting her secrets in the matter of the cause and cure of disease, must result in a general benefit to all who take part in such a congress. The science of hygiene and sanitation and demography must be given an impetus the world over by the temporary concentration in close quarters of men from all the world who have been giving their life work to the same problems. It is delightful to contemplate this phase of the congress, because it is one of those shining instances of worldwide organization for the promotion of the peaceful arts, of which I am glad to say the number is growing every year, and in which the common interest of humanity is made conspicuous by contrast with the selfishness and isolation of each nation in the conflict of interests that are typified by our burdensome and ever-increasing preparations for war. Such congresses can not but make for the permanence of

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peace. They must create a deeper love of man for man. They do stir up in the membership of such a congress, having representation from all the world, a greater human sympathy, and offer to the scientific student who is willing to devote his life to the development of a truth that shall add to the health and comfort and happiness of his fellows a reward that can not be measured in money, but is to be found only in the consciousness of the highest duty well done. But while these things are true with respect to the world effect of such a congress, its local influence upon a country like the United States is much more marked and important in the impetus that it gives to all who are responsible for the health of the community either in their profession or by reason of their official and governmental responsibility. They must have in such a meeting as this their ideas and their knowledge enlarged, and they must derive an inspiration for better and more enthusiastic work from the commingling of the greatest scientists of the world here, and their exchange of views, and from the very energizing atmosphere of the congregation. I should think that such a congress as this would increase the number of novitiates for the profession of medicine and surgery. Within the last 50 years no profession has shown such progress, no profession has come near it in the development of its importance for the promotion of the health and comfort of mankind; no profession has offered to its devotees, in such measure, the priceless reward that comes to any one who has wrested from nature one of her secrets and by disclosing it to his fellowmen has furnished a means for their happier lives.

I congratulate the medical profession of the United States upon this great congress, whose coming here is due largely to their initiative, and the membership of which in large part represents the medical science of the world.

Ladies and gentlemen of the Fifteenth International Congress on Hygiene and Demography, I welcome you to America. I welcome you to Washington. I sincerely hope that your stay here may be as pleasant and agreeable as I am sure it will be useful to this country and to the world.

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ADDRESS OF THE PRESIDENT OF THE CONGRESS

Dr. HENRY P. WALCOTT.

PUBLIC HEALTH IN AMERICA.

I shall not easily find words to express my gratification at the distinguished honor that has been given to me of presiding over this assembly of the men who have so distinguished themselves in the fields where my own humble services have met with a more than adequate reward; but permit me to say, with all the emphasis I can give to my words, that, standing here under conditions that can never again recur, I am profoundly sensible of the highest distinction of my life.

I am well aware that I owe this place to the fact of my relations to the State Board of Health of Massachusetts, the first board created in this country with the general powers of a central authority in matters concerning the public health.

BOARDS OF HEALTH.

So far as the 48 States which now compose this Union have enacted laws on sanitary matters, they have framed health codes differing somewhat in details and adapted to the requirements of the people in each State, but agreeing in this, that they have dealt with the whole vast subject of the protection of the public health among their own inhabitants.

The boards of health created in these States have had essentially the same history; they have begun their existence with advisory powers, and have been intrusted in the course of years with executive functions more or less extensive. In some instances they have charge of the vital statistics; in other cases this most essential support of any comprehensive system of public hygiene is in a separate department.

The activities of these boards, except in some limited fields, are not so closely connected with the everyday wants of the people as are the municipal authorities.

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It may be said that the tendency on this side of the Atlantic, in this branch of government as, indeed, in our political affairs in general, has been to bring the real power as near as possible to the people. For this reason, in my own State certainly the most powerful organization for health purposes is in the hands of the local boards of health. While these are not always the best agents for the purpose, at present, they are worth all the trouble the State may take in the way of advice, instruction, and assistance, because their efforts will lead more promptly and with greater satisfaction to the education of the whole people in reasonable sanitary administration than any other means now available. It is on this education of the population as a whole that all measures for the sanitary protection of the community must finally rest.

A police system which shall regulate all the doings of a person who happens to be a source of danger to his fellows is inconceivable, in this country at least, and certainly not to be desired, if any other means of relief can be found.

In some of our States provision is made for an appeal from the action of the local authorities to the State boards. In the majority, however, this appeal is of a very limited character.

Our guests may find it difficult to understand the peculiar relations of the States to each other and to the Government at Washington if they do not remember that the original States are older than the Constitution of 1787, and had many generations of self-government before the formation of the Union. They were inhabited by men largely of English origin, tenacious of their rights, and accustomed to settle their public affairs in open meetings. They entered the Federal Union with more or less misgivings as to the rights which they might be compelled to surrender for the purpose of securing the undoubted benefits that belong to a national government. They therefore retained every function which was not specifically transferred to the central authority. In 1787, the date of the formation of the Constitution, public hygiene can not be said to have had an existence. Obvious nuisances were dealt with in haphazard fashion, and when quarantines were established they were usually futile, ill-conceived, and needlessly oppressive. Generations were to come and disappear before the sure foundations were reached on which the modern structure of preventive medicine could be built.

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RISE OF PREVENTIVE MEDICINE.

Enlightened men in several countries had indeed taught some of the practices which protected the health of restricted groups of men, but for the community there was no relief. Rich and poor suffered alike, with the difference, however, that the wealthy paid from their abundance and the poor from their poverty and with their bodies.

In the eighteenth century preventive medicine had already reached a stage of development in Great Britain which placed that country in the lead of the world. It is only necessary to mention the names of Dr. Richard Mead, who in 1720 published his treatise on "Pestilential Contagion and the Methods to Be Used to Prevent It"; of Sir John Pringle, who wrote on "Diseases of the Army," and of Dr. James Lind, who wrote an admirable treatise on "The Means of Preserving the Health of Seamen," which pointed the way to the practical eradication of scurvy from the British Navy. Lind also advised a treatment of typhus on which modern practice has made but little improvement.

From the labors of such men as these came a better practice, with results which in turn served as the most persuasive of teachings. The achievements of the century reached their highest point in 1798 in Jenner's discovery of vaccination, the greatest redemption from disease the world has known. Yet side by side with these memorable additions to the world's knowledge of the means of preserving health, views were prevalent as to the origin of epidemic diseases, hypothetical in kind and of such nature as to preclude the possibility of any control of contagion.

LACK OF ADEQUATE LEGISLATION.

In the entire absence of any positive evidence as to the real nature of the more important diseases—or as to means for the prevention of pestilence—it was not unnatural that the framers of the Constitution of 1787 should not have included in the provisions of that document some reference to measures for the preservation of the public health. The strict constructionists of that instrument have held that the power of the United States to enact laws for the sanitary control of the country was to be found only in that clause which authorizes the United States "to regulate commerce with foreign nations and among the several States." On this slender thread was to hang our public-health service.

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The census authorized by the Constitution was for the purpose merely of counting the inhabitants. Lawmakers have been persuaded by public opinion to give a scope to the census approaching that of other civilized lands, so that in time there will be a sufficient body of vital statistics to enable us to determine some of the many questions which our unparalleled mixture of races offers. Our experience has already shown in limited areas great variations among the different stocks in resistance to disease, fecundity, and longevity.

It is also true that it was found possible to attach to the Marine-Hospital Service in the Treasury Department some of the functions of a national board of health and this organization has performed its difficult task with conspicuous ability. Its able officers have always been subject, however, to the control of the Treasury Department, and that branch of the Government is always more likely to be indulgent to the great business interests of the country than attentive to the suggestions of the trained sanitarian. Nevertheless I am not willing to admit that a due regard to the well-being of the whole community involves of necessity in any case a real injury to legitimate business. The suppression of the truth with regard to the existence of a pestilence in some of our cities has inevitably brought in the end such feelings of distrust on the part of those who have been too credulous, that they will be reluctant to yield hereafter to any evidence, however complete.

The various political parties have invited the attention of the voters of the country to the political platforms in which are set forth their respective policies. The declarations on the subject of the public health ought to satisfy the most ardent advocate of that cause. Therefore there is hope that our legislative bodies may find some way for bringing together the various sanitary functions now exercised by different departments of the Government at Washington, and make them into a dignified and independent whole under a title which may signify that the preservation of the public health is no less the business of a Federal Republic than it has been of the various monarchies of the world. A bill to accomplish this purpose is now awaiting action in Congress. It was introduced by Senator Owen, of Oklahoma, and has the hearty approval of the health organizations of the respective States and of all who have an intelligent and honest interest in measures for the protection of the public health. It meets the opposition of the very few who still believe that such legislation lies beyond

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the powers of Congress, but its more important enemies are to be found among the selfish interests which fear diminutions of profit in the various enterprises which seek the cover of darkness. Those interests employ able attorneys and make much outcry about interference with the personal freedom of the citizen, although no provisions of this wise act can be construed to have this effect.

STATE AND FEDERAL SANITARY ADVANCEMENT.

We present to you, our friends from other lands, the interesting spectacle of a successful democracy with, at heart, very conservative tendencies. We enter on almost interminable discussions on subjects of legislation and are apt to delay until an impatient public opinion forces the legislation to a conclusion. Our safety lies in the fact that our people have become educated in the matter under debate, at least, as early as our lawmakers. Our States and municipalities have therefore a more extensive, more connected, and more instructive story of sanitary advancement than has the General Government.

The establishment in England of a system of vital statistics in 1837 was followed by Massachusetts in 1842. The improvement in the sanitary condition of cities, which the epidemics of cholera forced on the Old World, were for the same reason made here. In the absence of a sufficient knowledge of the causative agent, the measures everywhere pursued were uncertain and to some extent ineffective; but a better conception of the value of pure water supplies and more efficient systems of sewerage resulted from the stern teachings of this pestilence.

One name stands out above all others in the sanitary awakening of England, that of Edwin Chadwick. It would be a work of supererogation to tell this audience of his life work. Although his name always deserves honor, I mention it for the purpose of naming Lemuel Shattuck, of Massachusetts, who submitted in 1850 to the legislature of that State a scheme for State medicine so far-reaching that it had to wait nearly 20 years for its adoption and more than 50 years for its completion. Shattuck was inspired by the work of Chadwick and was more fortunate than his master in that his structure still endures. It would be out of place to describe more fully the work of the State Board of Health of Massachusetts. Starting earlier in the race than its fellows, it has watched without envy the

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approach of its competitors, and has gladly adopted when possible their procedures.

While it is true that the largest powers in the control of communicable diseases are lodged with the respective States and must necessarily be vested in them, it is also true that the General Government has accomplished more in the scientific investigation of the causes of disease and has been of assistance to States and communities unable or unwilling to carry out all the measures requisite for the protection of their neighbors or even of themselves. The examples which have been given by the various services at Washington of invaluable work in the study of disease are well known to you. In the multitude of workers the world is apt to name only those who made the actual discovery, forgetting that many of the patient searchers have contributed much by indicating where the treasure was not to be found.

PREVENTING THE SPREAD OF COMMUNICABLE DISEASES.

This continent has borne beyond the lot of civilized countries on the other side of the ocean the burden of yellow fever, which has brought in its train a greater panic fear and a wider dissolution of society and public affairs than any other pestilence. The mysteries of its progress led intelligent men to look to the great disturbances of nature for a cause. It had more than once invaded a city as far north as Boston and scattered its inhabitants in terrified confusion. Within our own time it had, for a brief period, rendered inaccessible the government of a great State. No effort had been spared in the attempt to obtain a knowledge of the real nature of the disease or some empirical means of preventing its spread. The brutal force of an unscientific quarantine had been our solitary guard. Competent medical men had been detailed from the services at Washington to study the disease in its home on the shores of the Caribbean Sea. They brought home proof of what it was not. Finley, of Habana, had suggested that the mosquito might be the vehicle for the infection. His brilliant hint had not been followed by convincing experiment. Walter Reed and his associates carried on in Cuba the investigations which finally established the absolute dependence of the disease on the agency of a mosquito, and yellow fever has ceased to be a plague, except in a community too indolent to make a proper use of a piece of mosquito netting and to take active measures for the

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removal of the breeding places of the insect. One last conquest remains—the isolation and the exhibition of the agent transmitted.

Another instance of successful dealing with a formidable menace to the public health has been the treatment by the Public Health Service of the bubonic plague on our western shore. Selfish commercial interests prevented the seasonable announcement of the presence of the plague in San Francisco and caused unnecessary delay in the work of investigation and control. One important observation has been the extension of the disease to animals not hitherto shown to be generally infected, so that it can now be understood why the disease may remain concealed for a time and then break forth when least expected. We do not know, however, why an easily communicable disease should make its appearance on these shores for the first time, or why England should again be visited by it after the lapse of two and a half centuries. Again, this disease is not likely to be restrained by State boundaries, for whatever may be our means for restraining the movements of man, the rat and the squirrel do not recognize State lines, and nothing less than the authority of the Nation can act with sufficient promptness to secure the best results.

With the presence of the disease in Porto Rico and Cuba the danger is imminent for the ports in close connection with those islands, and consideration of this peril may well engage the attention of this Congress.

Since the acquisition of the Sandwich Islands we have found ourselves face to face with the problem of leprosy on a large scale. This most ancient of named diseases, in earlier medical history probably a mixture of many diseases, has dominated the imagination of men through all times; it has been the exemplar of all that was dreadful in the afflictions of man; it bore the brand of a curse from on high. There is no sufficient proof that cases of the disease are more frequent here than they have been in the past, but in consequence of Hansen's discovery we have obtained the possibility of a definite diagnosis and can now speak with measurable accuracy of the number of cases existing in any community. At the beginning of the year 1912, 146 cases of the disease were known to exist in the United States. These were cared for with varying degrees of precaution by the authorities of 17 States. Three States only, California, Louisiana, and Massachusetts, have established isolation hospitals to which lepers must be removed and segregated. In the great

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majority of cases in this country leprosy has been an imported disease, and fortunately in portions of the Northwest, where infected individuals from Scandinavian countries brought the disease many years since, there has been no increased prevalence of leprosy, but, on the contrary, an apparent disappearance. Great changes in habits of living have probably exercised a helpful influence in bringing this result to pass.

If we are to insist on rigid isolation, these patients could be taken care of much better in some central station under favorable climatic conditions and under the supervision of the national authorities. It is proper that the Federal Government should undertake this responsibility, because the victims of this disease are, in the main, importations for which no one State should bear the burden.

At the leprosy investigation station in Hawaii the successful cultivation of the lepra bacillus on artificial mediums has been accomplished. Monkeys have been inoculated, and important additions to our knowledge may be confidently expected.

We congratulate ourselves on the freedom of the country from outbreaks of cholera, notwithstanding the fact that 25,000 out of the 237,000 immigrants landing last year at the ports of Boston, New York, Philadelphia, Providence, and Baltimore came immediately from cholera-infected countries. In the search for carriers of the disease at the port of New York over 23,000 bacteriologic examinations are reported, with the result that the vibrio of cholera was found in 28 persons having the disease and in 27 persons who appeared to be in good health. The Italian Government has aided this country by its measures to secure favorable sanitary conditions on board vessels conveying emigrants. The royal commissioners, who are officers in the naval medical service, are attached to these vessels and have very extensive powers in the management of the passengers in all matters concerning their health. It has been officially stated that the aid rendered the quarantine service by the royal commissioners has been of a very high order. Another important measure of cooperation has thus been undertaken which illustrates the newer spirit which the Paris Convention of 1903 and the Washington Convention of 1907 have brought into the administration of quarantine. The experience of the past year is memorable, because for the first time in our own quarantine history, and anywhere on such a scale, the principle of the enforcement has been that any suspected person who

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is shown by laboratory examination to be free from the possibility of conveying infection may be admitted to the country.

THE PANAMA CANAL.

To many here the construction of the Panama Canal may seem to be the most important of our sanitary achievements. The United States, taking advantage of its Cuban experiences in dealing with tropical diseases, and employing the same skilled agents on the newly acquired property in the canal, has carried the work so rapidly toward its finish that we may well hope that the present Chief Magistrate may see in his present term of office the virtual completion of the task. He had a controlling influence in determining the form of the canal while Secretary of War, and has been an active and much interested and wise helper in every stage of its progress.

The French engineers who began the work, and who had labored energetically and skillfully on it, had nothing to learn from others in their own department, but it became impossible to maintain efficient organizations under the circumstances which then existed. The mortality and morbidity rates from malaria and yellow fever previous to 1904 would sooner or later have brought the work to a standstill.

Col. Gorgas, to whose immediate supervision the sanitary work was intrusted, has made an interesting comparison of the vital statistics of the population of the Canal Zone with a well-regulated city in a Northern State containing nearly the same number of inhabitants. The rates do not differ essentially in the two communities. Whether the example thus offered to the countries in the neighborhood of the canal will be followed may be a question, but it seems to have been shown that it can be followed and at an expense not of itself prohibitive.

PROBLEMS IN PUBLIC HEALTH WORK.

The International Congress of Tuberculosis held in this city in 1908 was a powerful stimulant to our people in promoting measures for limiting the spread of this disease. The interest in such measures is world-wide. Trustworthy statistics show that the successes obtained are commensurate with the efforts put forth. The relations of the State or municipality to the patient who may be treated at the expense of the public are not yet satisfactorily settled, and there are

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other difficulties in the situation so serious and so complex that we ask for the benefit of the wise counsels of this body of experts.

Pellagra, which has long been looked on as a disease of southern Europe, has recently been recognized in portions of this country. The problems of the disease are attended by so many difficulties and uncertainties that we have not yet been able to come to satisfactory conclusions with regard to it. Hospitals and asylums for the insane, with their wrecks of humanity, have been the places where the disease has been most closely observed, with the obvious difficulties of obtaining sufficiently correct histories of the early stages of the disease. Whether maize in a damaged state is the important factor in producing the disease can hardly yet be asserted. Taking into consideration the vast importance of Indian corn as a food product in this country, we earnestly invite your aid in the discussion of this question.

The venereal diseases are ever perplexing subjects for State control; our various experiments in this direction will be brought to your attention. It is too early to claim results of much value, but hardly any one disease is of so much importance to the public welfare as this, and the time is long since past for neglect and silence concerning it. Visitors from this country to that unequaled display offered to the world at the great Dresden exposition were much impressed by the completeness of the information presented by the department of sexual hygiene and brought home ideas that can not fail to have an influence here.

Epidemic cerebrospinal meningitis has been one of the diseases thoroughly studied at the Rockefeller Institute in New York, with the resulting discovery of an antidote serum; the epidemic form of this disease has become amenable to treatment through intraspinal injections of the serum. This success is full of encouragement for the efforts being made to discover a serum treatment of infantile paralysis which has appeared in recent years in all parts of the country and has been here as elsewhere an intractable disease not yielding to any medical treatment, and mysterious as to its cause and means of extension.

The importance of milk as a food has caused much legislation for the purpose of improving the quality of the article offered for sale. The difficulty of regulating the traffic between neighboring States has had something to do with the present unsatisfactory conditions. Certain traditional forms of uncleanliness have accompanied the

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dairyman's occupation for generations, and an attempt to change them has been so generally resented by the producer that improvement has moved slowly. There has been a change for the better, however, in the milk supply of the large cities. But in this instance again affluence pays with that which it can easily afford, but poverty pays with its life. The grievous burden of excessive infant mortality, especially among the poor and careless, would undoubtedly be much diminished by a better guarded milk supply.

The reduction of infant mortality is one of the most important branches of public-health work now before us. Unfortunately our infant mortality rates are not in general of a character which make possible the minute analysis which such tables possess in many of the countries from which you come. Some cities, however, possess statistics accurate enough to enable competent observers to draw conclusions which show results of an encouraging character.

I have enumerated some of the diseases that must fall under the notice of the public authorities. There are others to which I might well give a place, but they will receive due attention in some of the sections of the congress.

ADVANCE IN MEDICAL RESEARCH.

There has been no period in the history of the world when wealth has been so sensible of its duties as in this. Whether we may assert that the long practice of democracy in the United States is responsible for this condition or not I may not venture to say, but our men of great wealth have given of their abundance generously and wisely, and there is no more encouraging sign of the times than the earnestness with which wealthy citizens have applied themselves to the relief of conditions which are elsewhere matters of Government care. While it may seem ungracious to speak of a few evidences of this spirit, it would be ungenerous not to mention those great benefactions which are closely connected with the purposes to which we have devoted ourselves.

First of these great foundations is the Rockefeller Institute for Medical Research, created for the purpose of conducting, assisting, and encouraging investigations in the sciences and arts of hygiene, medicine, and surgery and allied subjects, in the nature and causes of disease and the methods of its prevention and treatment, and to make knowledge relating to these various subjects available for

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the protection of the health of the public and the improved treatment of disease and injury. The institute possesses in a suitable location in the city of New York a laboratory building and a hospital with a capacity of about 70 beds. Laboratory and hospital constitute as far as possible a unit. The scientific results obtained by this institution in the study and treatment of diseases which may be reckoned among the chief scourges of mankind are well known to you. The endowment funds amount to many millions. All this represents the enlightened public spirit of one wise and generous citizen. In order to relieve conditions resulting from the general prevalence through our Southern States of hookworm disease, Mr. Rockefeller has given $1,000,000 for immediate use in its treatment. Under the charge of the very capable commission charged with the expenditure of this money much human incapacity has been removed, and valuable lessons have been taught in the elements of personal hygiene. Great as these gifts are, still larger funds have been set aside by Mr. Rockefeller, most sagacious in his charities for the improvement of the condition of his fellows in many directions.

Other notable foundations for the promotion of the public health are the Memorial Institute for Infectious Diseases in Chicago and the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis in Philadelphia. The list might be enlarged by many other names of men and women who have given freely for the same unselfish purposes.

PUBLIC WORKS.

Domestic water supplies and systems of sewage disposal have received everywhere in the country in recent years much attention. The examples of our practice and the results of our investigations in these subjects have a well-recognized value. The Lawrence Experiment Station of the Massachusetts State Board of Health for the study of the process of sewage disposal has been for many years an authority of high rank, and its publications have had a wide circulation. Many of our large cities are situated on the shores of the ocean or on great lakes and rivers, and the easy method of disposal of sewage has been its discharge into these waters. The ocean will probably continue to receive all that can economically be brought to it without too great offense to the senses, but it is already evident

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that the large streams and lakes must be protected against increased pollution.

Our extravagant demands on the public water supplies have been met by constructions that challenge comparisons with the monumental works of the Roman world.

INADEQUATE STATISTICS.

The discoveries in the astronomical observatory have no more certain application to navigation, nor chemical research to manufacture, than have the statistics of life and disease to the protection of the human race. As a whole, this country can take little credit to itself in the registration of vital statistics. The registration area as regards deaths includes less than 57 per cent of the total population of the Union.

The public health officer should be able to call on some responsible department of Government for sufficient statistical data to enable him to recognize the unnecessary and preventable wastes of life in any given district. His conclusions would be justified only on the assumption that the data are accurate and that the calculations of the various observers are so similar in character as to be safely comparable.

Since the permanent establishment of the United States Census Bureau, that office has done much to promote registration and to secure uniformity in its methods. A model bill has been drafted by the office in consultation with the authorities of the States, public health and medical associations, and persons competent to advise in the matter, and trustworthy data should soon be obtained from the whole country instead of from only a few of the Northern States.

PREVENTION OF OCCUPATIONAL DISEASES.

The hygiene of occupations is within the control of the separate States and only indirectly subject to national legislation. The British factory act of 1802 to protect the health and morals of apprentices and other employees in cotton and other mills—the beginning of England's great code of industrial legislation—was not followed in this country for a generation or more, and then first in Massachusetts.

Manufactures have been so largely the occupation of the inhabitants of this State that the legislation probably comprises as complete a body of statutes and sanitary regulation as can be found in the country.

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This legislation has undoubtedly been highly beneficial to the workers in mills and factories, and so far as the conditions within the factory buildings are concerned, has promoted health; though it is true that the workman sometimes goes from the carefully guarded surroundings of his work place to the less favorable conditions of his own tenement.

There are still industries, however, which have not yet removed all the conditions inconsistent with health, and in which employers and workmen are alike unwilling to submit to unusual precautions for the purpose of avoiding personal injury or possible impairment of health. The legislation in several States appears to have reached a point where it may be asserted that this stage has passed and that we should now bend all our efforts to a course of determined and persistent administration in the hands of instructed and public-spirited officers acting with all the great powers conferred by existing statutes.

INSPIRATION FROM GREAT ACHIEVEMENTS.

On occasions such as this we must feel the silent influence of the great men who have labored in the cause which we are met here still further to advance. They gave us the knowledge which has made it possible to deal with a few of the problems that have perplexed the world. Can any intelligent man believe that we have reached the goal? There has never been a time when the religion of mutual helpfulness has had such sway as now, nor has there been a time when the means of accomplishing its great purposes have been so ample.

The names of Jenner, Pasteur, and Koch should be present in the minds of the members of a congress such as this. They contributed in the highest degree to the development of preventive medicine. Jenner discovered vaccination and, wise beyond his time, hinted that the vaccine vesicle was nothing but a modified smallpox and that in future some similar modification of the plague even might be obtained. Pasteur in his laboratory wrought to a scientific certainty the facts which prove the doctrine of infection, and the modification of the infective elements of disease. Koch devised new methods for studying microorganisms, and added to the list of the known producers of disease the bacilli of tuberculosis and Asiatic cholera.

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The living holders of the torch I need not name. Some are present here, and we shall all gladly greet them; some, though absent in body, are represented by their teachings and their works, and to these we shall do honor. What happier fortune can befall a man than to labor as these men have striven; their aims have been the highest and their reward the most worthy. Fortune has given to them nothing greater than the power, and their nature nothing better than the wish to serve their fellow men.

In conclusion it now becomes my duty to welcome in the name of the American members of this congress our associates who have journeyed, many of them so far, to join us in these meetings. Very few of you are strangers to us, at least in name, and we anticipate with pleasure the formation of that personal acquaintance which adds so much to the value of such gatherings as this. All our interests are the same; in our pursuits there are no limits as to monarchies or republics; thrice welcome to the United States.

After the address of the president of the congress, the roll of participating countries was called in alphabetical order according to English spelling.

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ADDRESSES OF DELEGATES TO THE CONGRESS.

For Argentina: Dr. Romulo Naon.

Mr. President: It is my very pleasant duty, first, to present to you, in behalf of the Argentine delegation, the warm appreciation of the welcome with which you have been kind enough to honor the members of this congress. It is especially gratifying to me to take advantage of this opportunity to emphasize the satisfaction with which my Government has accepted the invitation to attend the sessions of the Fifteenth International Congress on Hygiene and Demography. Both the Argentine Government and its people have always paid the most earnest attention to all that, either directly or indirectly, could refer to the welfare and happiness of our population, which, as you know, is being formed by men from all parts of the world, who want to build their fortunes under the freedom guaranteed by our liberal constitution and laws. Every day the appropriations devoted either to secure the benefits of public hygiene, or to stimulate private action in that direction, increase enormously. It has come to be with the National and State Governments, as well as with every municipal organization of our country, such an issue, as a public duty, that I might truly qualify it here as a governmental obsession. That is because, gentlemen, we realize that everything that looks to the lessening of the causes that disarrange the health of men, disturbing their physical and mental strength, and, on account of that, that of the social organizations which they constitute, interferes, in a very serious way, with the calmness that must preside over the deliberations of every Government and endangers at the same time the wisdom of their decisions in conducting the internal affairs of their countries, or their always very delicate relations with the other sovereign States of the world.

Peace, that is undoubtedly the highest achievement of the most perfect social hygiene and the most intense actual aspiration of

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the human spirit, will be easier attained, in my judgment, the day when the benefits of public and private hygiene reach the most distant corner of the earth and the most humble homes of men.

In behalf of the Argentine delegation I have the pleasure of presenting to the Fifteenth International Congress on Hygiene and Demography the wishes of my Government for the success of its wise deliberations, and to this beautiful and historical city of Washington its cordial greetings, as well as the expression of its admiration for its marvelous development.

For Austria: Prof. Arthur Schattenfroh.

Herr Präsident, hochgeehrte Damen und Herren: Der Entschluss den Kongress für Hygiene in der Bundeshauptstadt abzuhalten hat überall das lebhafteste Interesse hervorgerufen, denn der Besuch dieses Landes, das ja erst durch eine beschwerliche Reise über das Meer erreichbar wird, eröffnet die Möglichkeit, die Entwicklung der amerikanischen medizinischen Wissenschaft im Lande selbst zu studieren und durch persönliche Eindrücke das Bild vollständiger und abgerundet zu gewinnen.

Die Organisation des Hochschulunterrichtes und wohl auch der Forschung ist in den Vereinigten Staaten in mehrfacher Hinsicht eine andere wie in Europa. Auch für die Hygiene gilt dies wohl, die hierzulande der Bekämpfung der Infektions-Krankheiten einen breiten Raum zuweist, und überwiegend auf der bakteriologischen Technik aufgebaut ist.

Um so lebhafter ist dieser Wunsch, in Ihre Kreise einzudringen und Ihre Forschungsrichtung und Ihre Methodik genauestens uns zu eigen zu machen. Ich möchte nicht unerwähnt lassen, dass ich auf der Durchreise durch New York bereits an der Schwelle eines der hervorragendsten Erforschungsinstitutes, das Rockefellerinstitut, gestanden bin und mit besonderer Freude hierbei dem hervorragenden Bakteriologen Prof. Flexner die Hand drücken durfte.

Ich habe die Ehre, den Kongress im Namen der österreichischen Regierung aufs Wärmste zu begrüssen und seiner Tagung das beste Gelingen zu wünschen. Wir werden uns eifrig befleissen uns an den Sitzungen nutzbar zu beteiligen.

Ich entledige mich weiter des Auftrages der Wiener Universität, die, längst in eifrig gepflegten Beziehungen zu amerikanischen

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Wissenschaften stehend, den Wunsch empfand, bei Ihren Beratungen durch einen offiziellen Delegierten vertreten zu sein.

Möge dieser Kongress sich seinen Vorgängern würdig anreihen und den Fortschritt der wissenschaftlichen und der öffentlichen Hygiene so wirksam wie es nur im Bereiche menschlicher Arbeitskräfte steht, finden.

For Hungary: Prof. Francis Tangl.

Mr. President, Members of the Congress, Ladies and Gentlemen: In the name of the Royal Hungarian Government and also in that of the Hungarian Royal University of Budapest, I have the honor to render the most cordial and warmest greetings.

It was a great honor to our country to receive from the United States the invitation to send delegates to this congress.

This hearty invitation gives us a pleasant occasion to express—though not for the first time—the boundless admiration we feel for the country of splendid progress and unlimited liberty. The Hungarian people is a small one, but our love of liberty and independence is the greatest one, and the statue of George Washington erected by our people in our capital proves our homage for the heroes of humanity, for the greatest one fighting for the independence of a nation.

We come to you with the most sincere hopes for the greatest success of this gathering; the illustrious names of the committee preparing this congress are the best guaranty of it.

I am personally happy and proud of the opportunity to meet so many bright lights of the American scientific world, who carry the "star-spangled banner" to the foremost ranks of true human culture.

I greet you once more in the name of the Royal Hungarian Government.

For Belgium: M. le Dr. Melis.

M. le Président; Mesdames; Messieurs: Avant toutes choses, je tiens à remercier le gouvernement des Etats-Unis de l'hospitalité qu'il nous donne. L'hygiène et la démographie prennent une place de plus en plus grande dans les préoccupations du monde médical. Les gouvernements, a leur tour, comprennent qu'ils ne peuvent se desintéresser de ces questions d'une importance majeure. Aussi la

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Belgique n'est elle pas restée indifférente. Le département de la guerre et le département des chemins de fer ont saisi avec empressement l'occasion qui s'offre en ce moment d'affirmer ses sympathies pour l'œuvre de science qui va s'élaborer et m'ont délegué pour assister à ce Congrès. Je suis heureux et fier d'avoir été choisi pour prendre part à ces travaux. Les Etats-Unis d'Amérique sont un grand pays, grand par son étendue, grand par la hardiesse et l'énergie de ses conceptions dans tous les domaines.

Je suis convaincu que les discussions qui vont s'ouvrir se ressentiront de cette influence et que je rentrerai dans mon pays avec une ample moisson de faits.

Le comité central d'organisation a assumé la lourde tâche de rendre facile la mission des délegués. J'ose affirmer dès maintenant qu'il a reussi et je le remercie dans la personne de son Secrétaire-Général, M. le docteur Fulton.

For Bolivia: Dr. Nestor Morales Villason.

Señoras, Señores: Honrado por el Supremo Gobierno de Bolivia para tomar parte en las deliberaciones del XV Congreso Internacional de Higiene y Demografía que se inaugura hoy, mi primera palabra debe ser para saludar a la gran Nación Americana que ha querido dar tregua por un instante a su laboriosa actividad, para ofrecer su culta capital como punto de cita a las entidades más eminentes del mundo científico.

Bolivia, que, gracias al esfuerzo y honradez de sus hombres públicos, ha llegado a obtener mejoras considerables en sus condiciones industriales y financieras, no podía permanecer indiferente a la galante invitación del Gobierno de Washington para constituir una delegación que la represente ante esta ilustre asamblea. Es por esta razón que he sido enviado para escuchar los consejos de los más ardientes luchadores por el mejoramiento material y moral de la sociedad, para volver a mi patria provisto de los conocimientos necesarios sobre los medios que pone la ciencia a su servicio, para hacer brotar el bienestar allí donde reinaba la desolación y la vida en lugares que asolados por flagelos epidémicos habían sido convertidos en vastas necrópolis, cerradas por barrera de terror, a los progresos de la civilisación.

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En la América Latina, llena de riquezas inexplotadas, guardando en sus bosques prodigiosas fortunas y en sus montañas tesoros inagotables de oro, plata, bismuto, estaño, y cuanto mineral es útil al esfuerzo humano, el trabajo quedaba paralizado por la enorme mortalidad y la marcha de los pueblos se efectuaba penosamente. Es entonces que los respetados maestros de la vieja Europa y los ardientes investigadores de la América floreciente, pronunciaron las palabras de redención—*las enfermedades se las debe evitar.* Desde ese día, todo ha cambiado; las estadísticas acusan una mejora considerable de las defunciones y dolencias, pero esto no basta, es necesario hacer aun mucho más y este es el noble fin que nos reune en este resinto.

A nombre del gobierno y pueblo boliviano, saludo a mis distinguidos colegas haciendo votos por que sea eficaz su labor y agradezco a la noble ciudad de Washington por la hospitalidad que nos dispensa.

For Brazil: Dr. Alfredo de Graça Couto.

Mr. President, Ladies and Gentlemen: I will not tire out your kind attention by reminding you of the historical periods traversed by hygiene in successive conquests and laborious investigations from the remotest eras until the days of the great Pasteur. This great scientist, confined in the solitude and quiet of his laboratory, with that past and ready intelligence which pierced and perceived everything, after accurate and tiring studies enriched science with precious and sure information, thanks to the discovery of beings infinitely small—a fact which shook the theory of spontaneous generation to its foundations.

A great revolution was operated in the scientific world of those days, increasing by brilliant affirmations the solid progress of modern hygiene. The extraordinary discovery of Pasteur produced the best results in innumerable branches of medical science leading to the most beautiful investigations on the pathogeny of diseases and determining the microbian nature of a great number of them.

The eminent scientist whom France was so proud to count as one of her sons became then the idol of mankind, and in all countries of the world his name is remembered with eternal gratitude for the good he did, opening a new era to scientific investigation and to humanity.

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As a result of this wonderful discovery many and many mysteries were solved, and truth triumphed over prevailing error.

This task, however, was not to be accomplished by one man alone. Other scientists of note and repute devoted their time and their knowledge to the task commenced by Pasteur, thus completing his memorable work.

The study and the perusal of this series of scientific discoveries is a matter which demands so great a knowledge and experience that I will not even attempt to give you the general outlines of the deeds of this host of illustrious men of science. They spread throughout the world the conquests of their efforts, their work, their intelligence, and their erudition. I allude to these men of genius who have disdained the vanities of life to confine themselves to the serenity of laboratories and to the obscurity of hospitals, where there is nothing but tears and groans, where death wrestles with life, where their solicitude is devoted to those who suffer; where they expose themselves to all sorts of labor and fatigue, facing all kinds of perils.

Such men belong to mankind, and the light emanating from their works is spread in glorious flashes all over the world.

The International Congress on Hygiene and Demography brings together in the beautiful capital of the United States of America scientists of all countries of the world, united by the same patriotic feeling, in order to give mankind the benefit of their studies and investigations; and in this scientific fraternity no one dares to ask where the first initiative, the first experiment, the best study comes from, or in what country the greatest achievements were accomplished.

Science has no home; it belongs to all nations which contribute to universal civilization.

This is why, ladies and gentlemen, the humblest member of this congress, without claiming to give a minute and exact account of the present evolution of hygiene, begs leave to give you an unpretentious and brief outline of the great researches recently made which throw light on the genesis of diseases of an exotic origin and which have been put into practice on a scientific and sure basis with prompt and surprising results. The terrible scourges which hindered the development and progress of Brazil have been entirely banished.

The distinguished Prof. Chantemesse, in his remarkable work on yellow fever, thus expresses himself with regard to South America:

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"Leurs services sanitaires sont organisés; ils ont sû faire des sacrifices pecuniaires considérables pour chasser de leur sol, non seulement la fièvre jaune, mais aussi les maladies infectieuses en général." He says further: "Prenez garde de voir un jour, peut-être proche, les peuples de la jeune Amérique combattre à leur tour, l'importation sur leur sol redevenu vièrge, de ce qu'ils appeleront les maladies pestilentielles européennes."

Yellow fever, the epidemic devastations of which in the capital of our country caused its discredit abroad and the ruin of its material development, was progressing with impunity due to our lack of resources for its extinction; plague broke out with an alarming intensity, and other infectious diseases followed in a constant and alarming manner.

In the precise moment of our country's sanitary recovery, the experiences of Reed, Carroll, Agramonte, Lazear, and of Guiteras, at a later period, confirmed in Cuba the wonderful discovery of the doctrine of the eminent scientist, Carlos Finlay, of the transmission of yellow fever by mosquitoes.

By means of an appropriate hygiene, the Americans applied in Cuba the specific prophylaxis of sure and fruitful results, thanks to which the complete sanitation of the pearl of the Antilles was obtained—by expelling therefrom yellow fever, which was the terror of its foreign population.

The Government of our worthy president, Rodrigues Alves, inspired by such principles, inserted in their program, as its capital point, the complete sanitation of Rio de Janeiro, specially as regards yellow fever, which was precisely the disease which caused the greatest damage to us.

This honorable and difficult task was intrusted to a young bacteriologist of repute, Dr. Oswaldo Cruz, an old pupil of the Pasteur Institute in Paris, who was then managing the Serumtherapic Institute at Manquinhos. Thoroughly acquainted with the Habana theory, which he fully adopted, and with a perfect knowledge of the biology of the Brazilian mosquitoes and of the pathology of the Tropics, he undertook to exterminate the epidemics of yellow fever within three years, establishing as a condition for success the reorganization of the sanitary services.

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Thus conveniently equipped, he set to work with skill and pertinacity, combining his action with that of two men of the Government, Lauro Müller and Pereira Passos, who transformed an old and unhealthy city into a beautiful capital, promoting there also the colossal works of the port, opening splendid avenues bordered with buildings with all modern requirements of hygiene, reestablishing the system of sewers and the water supply, and creating all sorts of material improvements in the metropolis.

This huge work was done with the greatest success. Yellow fever disappeared completely and the general death rate decreased considerably.

The result of our experience gained through a persistent and incessant struggle, in spite of the indifference of some and the ignorance of others, was communicated to the Fourteenth International Congress on Hygiene in Berlin, 1907, where Brazil won the honor of the sole gold medal offered by the eminent sovereign of the German Empire, and later, in the Exhibition of Hygiene at Dresden, our efforts were rewarded with great applause.

Unforeseen circumstances against our will prevented us from submitting to your high appreciation the material and evident proofs of our scientific elements and of the resources and processes adopted by us for the execution of our work.

Allow me, however, to call your attention to the universal interest produced in the world by the remarkable discovery of my countryman, Dr. Carlos Chagas—the parasitic thyroiditis.

The Naval Institute of Tropical Medicine in Hamburg has just granted to this young scientist the coveted prize Schaudin—the founder of modern protozoology—disputed by eminent scientists such as Ehrlich, the creator of the magna therapia sterilisans, of which 606 is the most famous agent; by Metchnikoff, vice director of the Pasteur Institute in Paris, the discoverer of phagocytosis; by Roux, the victor in the struggle against diphtheria; by Laveran, the discoverer of the parasite of malaria; by Leishmann, the eminent naturalist; by Nicolle and Mesnil, scientists of great repute. The prize received its international confirmation in a jury composed of notable professors of the United States of America, of France, Germany, England, Italy, Austria, Russia, Portugal, Japan, and Brazil. Brazilian medicine was thus dignified and elevated by the discov-

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ery of a parasite which afflicts an immense population of our country in its vast area of 8,524,777 square kilometers.

It was not only the diffuse parasite that Carlos Chagas discovered, but also the insect which transmits and disseminates this disease, named "barbeiro." He explained the pathological anatomy, the symptomatology of the disease, he fixed the conditions of the diagnosis and of the prognosis, and prepared the ground for its prophylaxis.

His work will cause a revolution in the history of the trypanosoma by facts absolutely unknown with regard to its biologic evolution. Thanks to his discovery, the notion of a pathogenic duality was introduced in clinics, in phenomena which were supposed to be caused by one mechanism alone.

Pardon me, ladies and gentlemen, if I have fatigued you with the narration of these events, which will be crowned with the applause of all those who are interested in our scientific evolution, but, following the dictates of a good conscience, I felt it was my duty to communicate to this assembly of men of such high repute and great knowledge the course which medical science is following in my country, with a view to bringing a contribution to the efforts which the apostles of science are making for mankind.

Now, I beg leave to express before this distinguished audience my feelings, in the name of Brazil, toward the Government of the United States of America, the president and members of the congress, and the noble ladies who grace this ceremony with their presence, for the exquisite kindness and the princely hospitality which have been dispensed to us in this beautiful capital of their marvelous and progressive country.

For Chile: Surg. Maj. Alberto Adriasola.

Mr. President of the United States, Mr. President of the Congress, Ladies and Gentlemen: In the name of the Republic of Chile and of its delegation, I have the very high honor of greeting this distinguished gathering, consisting of the highest officials of this great Nation and of so large a number of the most eminent men in human wisdom.

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The United States of America—a country which overcomes all obstacles in its advance by gigantic steps toward progress in every sphere of knowledge—gathers to-day in its capital the wise men of so many nations, in order that they may contribute their light to the discovery and perfection of the great factors which go to make up the felicity of the human family.

Among these surroundings of energy, practical wisdom, and moral wealth, which characterize the sons of this colossal country, there is no question of the fact that the discussions which will take place during this meeting will be of immense benefit in arriving at a solution of the great problems of hygiene and demography which have heretofore retarded the advance of human progress.

The greeting of my country and of its navy, of which I am the bearer, is a cordial one and carries with it fervent wishes for the happiness of the American Nation and its wise Executive, and an earnest desire for the most complete success for this Fifteenth International Congress on Hygiene and Demography, which will on this occasion discuss its problem of high medical science in this most beautiful and romantic city of Washington.

For Costa Rica: The Minister, Señor Calvo.

Mr. President, Ladies and Gentlemen: I have the honor to convey the most cordial greetings of the Republic of Costa Rica to the delegates of all the nations represented here, and the expression of its good wishes for the best success of their important deliberations.

For Cuba: Dr. Federico Torralbas.[1]

For Denmark: Surg. in Chief A. C. J. Bornemann.

Mr. President, Ladies and Gentlemen: On behalf of the delegation from Denmark I have the honor to express to the Government of the United States of America and to the committee of the Fifteenth International Congress on Hygiene and Demography our grateful thanks for the very courteous invitation extended to the

[1] No manuscript furnished.

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Danish Government to be represented at this congress, consisting of such eminent and distinguished men of learning from all parts of the world. We are all the more grateful for this invitation, as you have done my country the signal honor of inviting us to be one of the four nations to present addresses giving detailed information concerning the sanitary legislation of the land. I sincerely hope that our contribution, modest though it may be, may all the same to some extent contribute to the great and beneficial work for the community at large which this congress and its promoters have in view.

I have the honor to present to the congress the very best greetings of my country and its Government.

For the Dominican Republic: SEÑOR FRANCIS J. PEYNADO.

SEÑOR PRESIDENTE, SEÑORAS, SEÑORES: En nombre de la República Dominicana, además de dar sinceras gracias por la galante invitación de que ella fué objeto y por la cordial salutación de bienvenida que acabamos de oir, yo saludo en vosotros y en el propósito que os ha congregado, una de las más brillantes manifestaciones del progreso, la que más caracteriza la edad moderna, la de resultados más positivos entre todas las que hasta ahora ha exhibido el esfuerzo, por la limpieza de cuerpo y de alma de la sociedad que pugnan para conquistar o para mantener el prestigio de la civilisación.

Para apreciar su transcendencia en toda su intensidad, después de considerar la pujanza del desarrollo intelectual que operarán el mundo las nuevas ideas que, después de sufrir acrisolado examen en esta illustre asamblea, han de divulgarse por todas los ámbitos del orbe que estén al alcance de la electricidad, de la imprenta o del misionero; el pensador debe ponderar el inmenso progreso moral que significan éste y los demás congresos dedicados, en definitiva, a legislar para el mundo entero sobre asuntos que realmente interesan al bienstar de todos pueblos, cúal que sua latitud respectiva, cúales sus diferencias de riquezas, población y poderío.

Porque sean como fueren los propósitos especiales que motivan esas conferencias internacionales—comercio, navegación, caridad hecha ciencia bajo la sabia dirección de la Cruz Roja, conciliación de intereses mundiales, nivelación de aspiraciones puramente re-

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gionales, higiene, demografía, a cualesquira otros, hasta los que no revelan altruismo a primera vista, siempre le permiten vislumbrar al ojo experto el objetivo más trascendental, de la fraternidad humana; puesto que cuantos concurren a ellas, lo mismo los científicos portadores de valiosas ofrendas, que los que solo aportamos nuestro entusiasmo, nuestra admiración y nuestros aplausos por sus develos y conquistas, todos, de segura, regresaremos a nuestros bien distanciados hogares, dejando olivado el bagaje de prejuicios y egoismos fronterizos con que vinimos y convertidos en exponentes y factores del ideal de la confederación universal, bien remoto aún, pero que ya alborea con destellos refulgentes, en Washington y en La Haya.

For France: Mons. Emile Kern.

It was my desire, before the opening of the congress, to inform myself concerning the conditions of hygiene in your great country, and for this purpose I have made a journey as interesting as it has been instructive. In many quarters I have found deep traces of the lives and works of children of France. Sometimes it is the language, and again it is the town which manifests a French origin; and in some places there are monuments commemorating the intervention of our ancestors in the war for your country's independence. I shall never forget the inspiring tour which I have made across America, nor the friendly consideration which has been extended to me everywhere. In all the cities which I have had the good fortune to visit I have been received with the greatest cordiality, and every facility for informing myself, for visiting public works and studying their organization has been placed at my command.

It is with much pleasure that I have seen the efforts made in the United States for the advancement of hygiene and the improvement of the public health. The results are highly creditable to the eminent hygienists who have brought us together in this congress at Washington. In meetings of this sort each of us can profit by the results obtained in the several participating countries.

I have spoken of the courteous manner of my reception here, but I must make separate mention and fuller acknowledgment of the generosity of the people of Pittsburgh. Arriving there without a line of introduction to anyone, I went to the office of the Pennsyl-

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vania Society of Engineers. I found the secretary very busy, like any good American, but I introduced myself and told him what I wished to see in Pittsburgh. He took me to the city engineer, who sent for the medical officer of health, and the three brought me to the mayor. I expressed my desire to become acquainted with the public waterworks and the great Carnegie steelworks. Immediately the mayor arranged for me to see the waterworks in company with the distinguished directing engineer. At the same time the mayor gave me a letter admitting me to visit the steelworks, and for fear lest some delay might hinder me from visiting the sewage works the mayor sent an official with me to the director of the works, with the request that all means be taken to economize my time.

When I was taking leave the mayor asked whether any further service could be rendered me. With charming good humor he inquired what impressed me most in Pittsburgh. "Being unable to render any service," I replied, "in return for your great amiability, I find myself most deeply impressed with your consideration for an unknown man who can do nothing whatever for you." Said the mayor: "I have done no more than my duty," a reply worthy of the great citizens of antiquity.

In a like friendly spirit I was received in New York, Boston, Buffalo, St. Louis, Chicago, Cincinnati, Washington, Philadelphia, and other places. Everywhere I saw evidences of great efforts in the solution of the difficult problems of hygiene and for the increase of human health and comfort. Allow me to recall, in this connection, a memory of the Hygiene Exposition at Dresden in 1911. Entering the large hall of the building called "Der Mensch" one saw a great statue, representing a powerful man, in the full joy of life, lifting his strong arms toward the sky. The pedestal bears this inscription: "No fortune can match you, Health!" an inscription which emphasizes the importance of hygiene, and the value of that combat which we wage for the public health, our purpose being in every way to add to the well-being of men a vigorous health, such as can not be attained or preserved except by a hygiene adapted to surroundings.

The delegates of France are happy in having been asked to work with you at the solution of the problems of public health.

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For Germany: Geheimrat Prof. Max Rubner.

Ich habe die hohe Ehre namens des deutschen Reiches den XV. internationalen Kongress für Hygiene und Demographie die herzlichsten Glückwünsche darzubringen. Zahlreich sind die Deutschen zu einem Besuch über den grossen Teich nach Washington gekommen, getragen von dem Gedanken der Hochachtung und freundschaftlichen Gefühle, die wir der amerikanischen Nation der Vereinigten Staaten Nordamerikas entgegenbringen, getragen von der Empfindung der hohen Wertschätzung und Anerkennung, die wir amerikanischer Wissenschaft und Forschung schulden.

Man kann häufig hören, die Wissenschaft sei international und deswegen hätten unsere Kongresse mehr die Aufgabe des persönlichen Gedankenaustausches und der persönlichen Berührung. Nichts ist unrichtiger wie diese Beschränkung! Alle Wissenschaften ruhen in ihren Anregungen auf nationalem Boden, erwachsen aus nationalem Bedürfnis, und haben daher stets ein nationales Gepräge. Nirgendwo ist dies aber so offenkundig, wie bei der Hygiene und Demographie, die als spezielle Wissenschaften vom Menschen ganz und gar sich zur Aufgabe gemacht haben, die Beziehungen zwischen dem Menschen und seinen nationalen Kulturbedingungen zu erforschen und zu erklären.

Jedes Land hat seine besondere Hygiene. Diese nationalen Eigentümlichkeiten sind hier in Amerika besonders ausgeprägt. Die neue Welt ist nicht nur neu, weil sie relativ erst spät durch Columbus für die alten Kulturländer entdeckt worden ist, sondern weil sie uns tatsächlich eine neue junge Kulturwelt bietet, die noch in Gährung und Entwicklung begriffen ist. Schon heute darf man sagen, der Congress zu Washington und der daran anschliessende Besuch des Landes wird in uns tausendfältige neue Anregungen hinterlassen.

Und dadurch erreicht unser Wanderkongress sein gewolltes Ziel.

Ein Kongress, wie dieser, eröffnet von einer so ausgezeichneten Versammlung, ist ein feierlicher Akt, der unsere Herzen höher schlagen lässt. Unser Gedanke wandert unwillkürlich zurück in jene Zeit, in der die moderne Hygiene entstanden ist, als vor 60 Jahren Pettenkofer als erster die Forderung aufstellte, die Hygiene muss um ihrer selbst willen und als Wissenschaft getrieben werden. Damals waren die sanitären Verhältnisse ein unbebautes Feld, die Seuchen dezimierten die Bevölkerung der Städte und des Landes.

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Welch' eine Veränderung in wenigen Jahrzehnten, welch' ein Fortschritt auf allen Gebieten der öffentlichen und privaten Gesundheitspflege, welch' Abfall der Mortalität! Keine Wissenschaft kann sich rühmen in gleichem Masse einen solchen umwälzenden Einfluss auf das Volksleben, auf die Volkswohlfahrt, und die sozialen Verbesserungen gewonnen zu haben, wie die Hygiene, die ohne brutale Gewalt und politische Erschütterungen in stiller Friedensarbeit ihre Ziele reifen sieht.

Mancher grosse Vorkämpfer ist bereits dahingegangen. Seit wir uns im Berliner Kongress zusammengefunden hatten, haben wir wieder einen unersetzlichen Verlust zu beklagen; den Verlust eines Gelehrten, dessen Leben eine Kette ernster Arbeit und epochemachender Entdeckungen gewesen ist, Robert Koch. Ueberall ist die Entwicklung der Bakteriologie seinen Spuren gefolgt. Was wäre, kann man mit Recht fragen, aus der Bekämpfung der Volkskrankheiten geworden, hätte man sich nicht auf seine Entdeckungen stützen können. Er ist von uns gegangen noch in der Vollkraft seiner Leistung, aber seine Gedanken und Werke leben für immer fort in der Wissenschaft, und werden auch künftigen Generationen die Waffen schmieden im Kampfe gegen Siechtum und Krankheit.

For Great Britain: Sir Thomas Oliver.[1]

For Canada: Dr. Frederick Montizambert.

Mr. President, Ladies and Gentlemen: I have been delegated by the Government of Canada to convey their most cordial greetings to the officers and members of this conference, and the expression of their hope that it will be a most successful one.

Public health has made wonderful strides in Canada as in other countries during the last decade. Though Provincial Boards of Health were established in Ontario in 1882 and in Quebec in 1887, it has been only comparatively recently that the work has grown to any extent. Now there are such Boards of Health in every one of the nine provinces of the Dominion, countless municipal Boards of Health, and there are many, many willing workers; and the enormous advance has been made of recognizing the importance of public

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health in our universities in the establishment of chairs in hygiene and the giving of diplomas in public health. There has been a gradual but very marked education of the public and of the medical profession. Take as an instance the progression of ideas about tuberculosis. Forty years ago it was regarded as hereditary, incurable, hopeless. Then came the idea of climate, the Riviera and Southern California; then altitude, our Northwest Territories, Denver and Colorado Springs; and then in the process of evolution the sanitarium became the do-all and end-all of efforts to fight the white plague. Now we recognize its value only as a link, an important link, in the chain. But we have come to know that the essentials are the outdoor life with regulated rest and diet. We have reached the preventorium, the dispensary with its all-important domiciliary visits, the day camp, the night camp, and the outdoor schools. And our dwellings are studded with window tents and with outdoor sleeping places on porch and veranda.

So in our protection from disease from abroad we have advanced to the greatly improved Quarantine Stations and modern Quarantine service of to-day; a service the best results of which, being preventive and negative, are apt to pass unrecognized. The recognition of the position of intermediate hosts is another great advance. The part played by the rat, the ground squirrel, and the tarbagan in the dissemination of bubonic plague, of the mosquito in yellow fever and malaria, the tsetse fly in sleeping sickness, and the common house fly in many diseases, are either quite recent discoveries or rediscoveries of forgotten truths, as in the case of the connection of the rat with plague, for we read in the Bible that when the Philistines, after they had taken the Ark of God, were stricken with the plague, they endeavored to propitiate Jehovah by offering five golden images of the most noticeable result of the disease, and five golden images of the rat family, the probable disseminators of the plague.

Our present knowledge of the water-borne nature of cholera and enteric fever, and our recognition of cholera carriers and typhoid carriers, are also marked advances. They have led, among other things, to the bacteriological examination of even the healthy immigrant arriving from cholera-infected countries. In this connection it might be interesting to note that a case of cholera, landing at the Quarantine Station on the St. Lawrence in November, 1910, although convalescent in a very few days, continued to give positive results in

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bacteriological examination until the middle of April, thus continuing as a cholera carrier for five months, which is, I have reason to believe, longer than any heretofore recorded. One encouraging indication of the advance of hygiene in Canada is the ever-increasing space devoted to the subjects connected with public health by the press editorially and reportorially, ever anxious and keen to note the trend of public thought. This would not be the case unless the public called for it. While, therefore, there is still much to be accomplished, so much has already been done that we may well take courage to go forward.

In conclusion, I would like to be allowed to say that, as I will not be able to be present at the closing ceremony of this Congress, I would ask to be allowed to take this opportunity in advance of expressing the grateful thanks of the Canadian delegates for the courtesies and kindnesses which, unless this Congress differs greatly from previous ones held in this beautiful city, will be extended to them by the kindly and hospitable people of Washington.

For Greece: Dr. L. L. Caftanzoglu.

In behalf of the Kingdom of Greece I want to thank the noble President of this great Republic for his greetings as well as for the hospitality accorded by the United States to all of us.

In Greece we fully appreciate the important part which demography and hygiene play in almost every branch of life, and we are watching with great interest the work of this congress.

These conferences, however, whether of a scientific or of a more intimate character between men living in distant lands, all working for the same object although under different conditions, can not but be favorable to the progress of science and to the scope to which many of you have devoted your lives, as well as to the general peace of the world.

I express the hope that this congress, too, will not only, by the work carried out, be as important as its predecessors, will not only signify further progress in the branch of demography and hygiene, but will add a stone to the edifice of universal peace in which all nations are so much interested.

And now, as hygiene and demography are Greek words, but surely not Greek to the members of this congress, I think I must conclude with two more Greek words expressing my greetings and best wishes: *χαίρετε—εὐτυχεῖτε.*

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For Guatemala: Dr. Joaquin Mendez.[1]

For Italy: Prof. Luigi Pagliani.

Gentlemen: I have the great honor to present to the presidency and members of the Fifteenth International Congress on Hygiene and Demography, the first celebrated in America, the best and respectful compliments of the Government of Italy.

The salutations of the Government of my native country include both the sentiments of great esteem and sympathy of the Italian people for a great nation, which has made, under the *ægis* of the largest liberty, such an immense progress in political and economical life, and, in a particular way, the appreciation, on the side of the Italian scientific men, of the essential part of cooperation that your country has given to the gigantic steps of the nineteenth century. in the knowledge and in the practical conquest in behalf of preservation of health.

If the exemplary consolidation and regulation, in such a short time, of your powerful and wealthy Confederation is the object of universal admiration the United States Government authorities must be so much the more celebrated by the studious of sanitary disciplines, for the unlimited confidence and power that they have, day after day, conferred upon the enlightened sanitary technical men in the interest of the progress of hygiene and of the welfare and the health of their people.

So it is that the memorable Civil War was a fair occasion for a precious instruction upon the dwelling of the new types of hospitals (1860–1865); that from Memphis came the best scientific example of a town's sewage system (1882–83); that the memorable experiments of Lawrence have afforded a formal guide in the biological sewage purification (1887–1893); that the fight against yellow fever was, in an astonishing way, victoriously won (1900–1902); that, in short, a great number of the United States towns have such a low percentage of mortality.

In Italy there was a man, the late Francesco Grispi, who had such same right conception of his political and social duty, and committed the preparation and the application of the sanitary laws

[1] No manuscript furnished.

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and of the sanitary organizations entirely to technical men, and it was for Italy the beginning of a new era of good sanitary conditions.

When the sanitary act of the 22d December, 1888, was applied, with the subsidy of appropriate means of prevention of the infectious diseases, the percentage of mortality began very rapidly to fall down, so that from about 28 per cent, as it was before the year 1888, it descended to 21.93 per cent in 1897; and, after that time, notwithstanding many occurring difficulties, it fell to 19.64 per cent in 1910; and what is more probative, in the same time, the natality has maintained its high degree of percentage (33 per cent).

Thus, Italy, which was already the favorite land for its natural beauties, for the arts, and for the sciences, became also a decorous place among the most healthy territories and the most increasing people in the civil world.

Fifty years of unity and liberty and the address and alertness of their governors have had the power to return the Italian people upon the route of welfare and strength for which the ancient Romans were celebrated.

Few countries have anyhow, like ours, such a high reason to send, on this great occasion, a thought full of satisfaction to the wonderful progress of hygiene in the last decennary and a feeling of profound gratitude toward the grand masters, beginning from Spallanzani, Pasteur, Koch, and Lister, who have brought the knowledge, directed to favor the welfare and health of human kind, to such a high degree.

For Japan: Dr. Seiji Tsukamoto.

Mr. President, Ladies and Gentlemen: On behalf of the Japanese delegates whose good fortune it is to assist at this great gathering, I permit myself to assure you that we regard it a valued privilege to take part in the conference and to come in contact with so eminent and recognized authorities in this particular branch of learning in various parts of the world. At the same time I can not let this occasion pass without giving expression to our sense of profound gratitude to the American Government for the liberal hospitality accorded us and the elaborate arrangement made for the assembly.

Japan attaches a very high importance to the noble and beneficent work of this institution. If she has much more left to improve than

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the nations of the West in the system and equipment of public sanitation, she is by no means behind any other nation in the zeal and anxiety to effect the desired improvements and to promote the common cause of this international movement. May every success crown the efforts of our congress.

For Mexico: Dr. Eduardo Licéaga.

Señor Presidente, Señoras y Señores: El congreso que se reune ahora en esta ciudad, capital de un suelo privilegiado, que lleva el nombre de quien fué el primero en la guerra, el primero en la paz y el primero en el corazón de sus conciudadanos: de Washington, quien con el resplandor de su gloria sigue alumbrando a los Estados Unidos de América. Este congreso, Señores, como los de higiene que le han precedido, se presenta trayendo el ramo de olivo a todos los pueblos de la tierra. Verdadero mensajero de paz, no trabaja por el bienestar de una nación determinada, sino que en su afán de procurar la conservación de la salud, la prolongación de la vida y el mejoramiento de la raza humana, ha olvidado las fronteras que limitan las naciones y solo piensa en la humanidad a cuyo mejoramiento aspira recordando aquel aforismo: *Mens sana in corpore sano* y confiando en que haciendo a los hombres sanos y robustos los hará buenos.

Señores, esperando que esta reunión de sabios que vienen de todas partes del mundo a traer su contingente de ciencia y de experiencia, logre realizar sus elevados ideales, me complazco en asociar el nombre de la República Mexicana al de las demás naciones que vienen a rendir este tributo de admiración a los abnegados misioneros de la ciencia sanitaria y de la paz universal.

For the Netherlands: Dr. M. W. Pijnappel.

Mr. President and Gentlemen: I am proud and happy that Queen Wilhelmina appointed me to be the delegate of the Government of the Netherlands to this splendid gathering.

It is well known in Holland what the American people are worth, how daring and enterprising your Nation is and how much, setting an example to the whole world, it does for the progress and benefit of mankind.

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We take an enjoyment in the fact and pride ourselves that many of you have ancestors of our blood and kin, and ever before as I met American people, and now again in crossing, I was happy in experiencing that they did not forget their origin, and continued to esteem and cherish our little country and its inhabitants.

I beg to bring you the very sincere compliments from my Government, and its best wishes for the success of the congress.

For Norway: Prof. Axel Holst.

Mr. President, Ladies and Gentlemen: At present about two and a half millions of Norwegians are living in Norway, and almost exactly the same number of Norwegians are living in the United States. Therefore, coming to the United States, I feel as if I were visiting the adoptive father of one-half of my countrymen. I beg to thank you for the mental and bodily health granted to this large part of my brothers and sisters by this—excuse my enthusiasm—the biggest country in the world.

For Panama: Dr. Ricardo Arias.

Dr. Henry P. Walcott, *President.*

Sir: It is with the utmost regret that I have to inform you that owing to unexpected and very pressing business in consequence of my leaving this legation at a very early future, I am compelled to deprive myself of the pleasure and honor of participating in the conferences of the Fifteenth International Congress on Hygiene and Demography to take place from Monday the 23d to Saturday the 28th instant, to which I had the honor to be appointed delegate from my country by my Government.

With assurances of my highest esteem, and reiterating my sincere regret, I remain,

Yours, very truly, (Signed) Ricardo Arias.

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For Russia: SURG.-GEN. DR. SIMON VON UNTERBERGER.

HERR PRÄSIDENT, MEINE DAMEN, MEINE HERREN: Unter dem Sternenbanner der mächtigen Vereinigten Staaten sind heute versammelt die Herren der Wissenschaft und die Männer des praktischen Lebens, um die Frage der Lösung näher zu rücken, wie das höchste Gut der Menschheit—die Gesundheit—zu rehabilitiren ist, welche durch die Cultur so schwer zu leiden hat. Diese Cultur mit ihren ewigen Fortschritten hat wie die Sonne ihre Flecken und deren Beseitigung hat vor allem unser Congress sich zur Aufgabe gestellt.

Im nächsten Jahre findet in St. Petersburg eine russische Hygiene-Ausstellung statt, und sie wird ein Bild geben von den Leistungen aus sämtlichen sanitären Gebieten und diese sind es ja die wiederum eine Forderung unserer gemeinsamen Culturarbeit uns auferlegen. Wir hoffen zahlreiche Vertreter auch der neuen Welt bei uns begrüssen zu können.

Für die liebenswürdige Einladung zum Congress sage ich meinen wärmsten Dank und bringe aus Russland viele herzliche Grüsse dem sympatischen Volke der nordamerikanischen Staaten.

GENTLEMEN: Personally it gives me great pleasure to see again so many of my friends in this gathering, and I hope to see you next year in St. Petersburg at the Russian Hygiene Exposition. Although the distance is very considerable between our countries, however, it is not longer from the United States to Russia than from Russia to the United States.

For Siam: PROF. PAUL G. WOOLLEY.

MR. PRESIDENT, MEMBERS OF THE CONGRESS, LADIES AND GENTLEMEN: I have the honor to bring greetings from His Siamese Majesty's Government to this, the Fifteenth International Congress on Hygiene and Demography.

To have Siam represented at such a congress as this gives me the greatest pleasure, because, from what I know of that country, the Government of which I served for two years, it seems to me that its greatest immediate needs are hygienic reforms. And since I have the greatest interest in the people of Siam I am exceedingly anxious that they should gain as much as possible from the confer-

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ences of the great men who are assembled here through the invitation of the Government of the United States.

It gives me the greatest pleasure on behalf of Siam to express before this congress the appreciation of His Majesty's Government for the opportunity of taking part in the coming deliberations.

For Spain: Dr. Vicente Llorente.[1]

For Sweden: Dr. Frederick G. Bissmark.[1]

For Uruguay: Señor Dr. Maria de Pena.

Mr. Chairman: On behalf of the Uruguayan delegation I wish to thank the President, and you, Mr. President Walcott, and you, Mr. Chairman, for the very kind words and cordial welcome, and I heartily join the delegates in their solicitous desire that the work of this congress will be most beneficial to all governments and all peoples.

These congresses are praiseworthy, not only for the opportunity to exchange ideas, for personal and friendly intercourse and sympathetic association of men of science of different nationalities, and so essential to the good understanding of each other's ideals and aspirations, but because of the opportunity thus given to compare methods and achievements of various nations, and in the discussions of these congresses the experiences of one country are made available for the benefit of other countries that are desirous to better conditions of life and health, to promote the social well being, to improve and perfect local and national sanitary services, and to develop all preventive and hygienic institutions, which all governments, in these days, seek earnestly to advance and consolidate.

This congress, the fifteenth of its kind, has the good fortune to be held in one of the most beautiful cities of the world, in the midst of an encouraging and benign atmosphere, in a country that stands to the fore and vies for scientific victories, and under the auspices of a Government determined to perfect the organization of sanitary services according to the urgent needs and best interests of its people.

[1] No manuscript furnished.

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To this congress Uruguay has sent its delegates to cooperate zealously with the warm desires of other nations, and is very happy to be associated with the distinguished and cultured members of this congress, and appreciates beyond measure the warm welcome, the sympathetic cooperation, the magnanimous spirit and good will, and generous courtesies of the American Government and people, of which the success of this congress is so largely assured.

For Venezuela: Dr. David Lobo.

Señor Presidente del Congreso, Honorables Delegados, Señoras y Señores: En mi caracter de delegado oficial de Venezuela al XV Congreso Internacional de Higiene y Demografía, es para mí motivo de complacencia, a la vez que de verdadero orgullo, el hallarme habilitado por esa designación para saludar especialmente, en nombre del gobierno de la República, al muy digno Señor Presidente de los Estados Unidos, que acaba de honrarnos con su presencia y su palabra, y luego a vosotros que, congregados en brillante asamblea, os preparais a discutir las más grandes y generosas cuestiones que hoy quizás privan, así en la vida interna, como en el trato internacional de los pueblos civilizados.

No de otro modo pueden considerarse, en efecto, los importantes al par que vastos problemas de la higiene pública y la sanidad internacional; porque ligados como estan íntimamente con la salud, energía y resistencia vital de los individuos, no menos que con el bienestar más complexo le las comunidades, no se concibe que pueda abandonarse su solución al acaso o a las simples defensas naturales, sin poner en grave peligro de paralización y decadencia la vida civil, industrial y económica de las naciones. Estas no prosperan con organismos debilitados por una alimentación defectuosa, afligidos por vicios morbosos hereditarios, acosados sin tregua por gérmenes infecciosos, destructores de la sangre y los tejidos: donde estas causas imperan, la población se estanca y degenera, la inteligencia se embota, las fuerzas decrecen, los ideales se apagan, y bien sabemos que sin estos grandes factores del movimiento mundial, no es posible que los países se fortalezcan, avancen y ocupen puesto distinguido entre las grandes entidades políticas de la tierra.

Nobles son, pues, vuestro empeño y vuestras aspiraciones al reuniros aquí, en correspondencia á la invitación del gobierno de los

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Estados Unidos; y si tales propósitos, junto con la firme intención que manifestais de ejecutarlos, no fuere suficiente a garantizar su realización, ahí están vuestros nombres, vuestra ciencia y vuestra autoridad como higienistas, para asegurar en no remoto porvenir los grandes bienes que de este congreso han de derivarse para la sanidad internacional y su definitiva regularización. En tan vasta empresa Venezuela marchará, como marcha ya, al igual de las naciones que estudian hoy seriamente todas las cuestiones relativas a higienización interna e internacional; y es este el momento de apuntar, en corroboración de mis palabras, que el Gobierno de Venezuela no omite esfuerzos, medios ni recursos por sanear el territorio de la República y hacerlo habitable para cuantos quieran aportar a él sus capitales y sus industrias, que allí han de florecer al amparo de leyes sabias y protectoras.

La campaña contra el paludismo, la fiebre amarilla, la peste, la fiebre tifoidea y las infecciones en general, está ya vigorosamente empeñada; y no creo transcurran muchos años sin que mi patria pueda ofrecer al mundo un extenso y rico campo de actividad, libre de causas morbosas al abrigo de las varias epidemias y endemias que aun azotan á muchos pueblos del antiguo y del nuevo continente.

Os reitero, Señores, el caluroso saludo cuya trasmisión ha tenido a bien encomendarme el Señor General Juan Vicente Gomez, Presidente de Venezuela, y os ofrezco a la vez mis personales votos por el completo éxito de vuestras labores, a las cuales me honraré en contribuir con el reducido acervo de mi experiencia en el país tropical a que pertenezco.

After certain telegrams were read and announcements made by the secretary general, the president declared the congress formally opened and the opening session adjourned.

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TRANSACTIONS OF THE PERMANENT INTERNATIONAL COMMISSION.

FIRST MEETING OF THE PERMANENT INTERNATIONAL COMMISSION.

The Permanent International Commission of the Congresses on Hygiene and Demography met at the New Willard Hotel, Washington, D. C., at 9 o'clock on September 26, 1912.

The following were present:

President, Prof. Dr. Max Rubner, Berlin, Germany.
Vice president, Dr. S. N. D. North, Carnegie Endowment for International Peace, Washington, D. C.
Prof. Dr. Friedrich Loeffler, Greifswald, Germany.
Dr. G. H. F. Nuttall, Cambridge, England.
Dr. Theodore Thomson, London, England.
Col. Walter D. McCaw, Washington, D. C.
Dr. William H. Welch, Baltimore, Md.
Dr. Henry P. Walcott, president of the Fifteenth Congress, Boston, Mass.
Dr. Frank F. Wesbrook, president of Section VI, St. Paul, Minn.
Prof. Walter F. Willcox, president of Section IX, Cornell University, Ithaca, N. Y.
Dr. Hermann M. Biggs, president of Section V, New York, N. Y.
Prof. Russell H. Chittenden, president of Section II, Yale College, New Haven, Conn.

President Rubner in the chair. Dr. John S. Fulton, secretary general of the Fifteenth Congress, acted as secretary.

The president called attention to vacancies which had arisen in the Permanent International Commission. He proposed that Dr. André Chantemesse, Paris, France, be elected vice president for France, in the place of Dr. Roux, who declined election, because of advanced age.

He proposed Prof. Dr. Langlois, professor of physiology, Paris, as a new member from France.

He proposed Prof. Dr. Mischler, chief of the imperial statistical bureau of Germany, to represent demography in place of Dr. Richard Van der Borght, who resigned.

He proposed Dr. Gregorevich, director of the imperial institute of statistics, St. Petersburg, Russia, to represent demography.

On motion of Dr. Welch, the above gentlemen were elected members of the Permanent International Commission of Congresses on Hygiene and Demography.

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Prof. Walter F. Willcox proposed the name of Mons. Lucien March, directeur de la statistique generale de la France, of Paris, France, to fill the vacancy caused by the death of Dr. Emile Levasseur. Mons. March was elected.

The name of Dr. Simon von Unterberger was proposed as an additional member for Russia. Dr. Unterberger was elected.

Dr. William H. Welch said that at the close of the Ffteenth Congress he would tender his resignation as a member of the Permanent International Commission, and proposed that Dr. Rupert Blue, Surgeon General of the United States Public Health Service, be elected to the vacancy. Dr. Blue was accordingly elected.

The president announced that he had received last evening an official invitation to hold the next meeting of the International Congress on Hygiene and Demography in Brazil, in the city of Rio de Janeiro.

He referred to the desire of many members of the congress that its next meeting shall be held in Russia, where it has never met. No official invitation had yet been received, and he felt that it would not be wise for the congress to propose a meeting in Russia prior to the receipt of an official invitation.

A general discussion followed in which the opinion was expressed that it was not desirable that two successive congresses should be held in America.

Dr. Welch said that if, before the Congress adjourned, no official invitation should have been received from a European country for the next Congress, the matter might well be left to the Permanent International Commission. He therefore moved that the president of the commission be authorized, after correspondence with the members of the commission, to arrange the place and the date of the next meeting of the International Congress on Hygiene and Demography. The motion was adopted.

The president announced that a final meeting of the Permanent International Commission would be held on Saturday morning at 9 o'clock sharp, at the Continental Memorial Hall, prior to the last plenary session of the Congress, for the consideration of resolutions formulated and presented by the different sections of the Congress.

Dr. F. F. Wesbrook, president of Section VI, presented the following resolution, adopted by that section for the consideration of the commission:

I. That the disinfectants used in different countries should be controlled by a simple bacterial test capable of being easily effected, and that a committee from this congress do confer with a committee of the International Congress on Applied Chemistry to define such test.

II. That the Permanent International Commission of the Congresses on Hygiene and Demography be requested to appoint a committee of not less than five members to represent this congress for this purpose.

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Dr. North moved that the above resolutions be presented at the plenary session on Saturday, and that the president of the Permanent Commission, after consultation with the president of Section VI, be authorized to name the members of the proposed committee. Adopted.

Dr. M. W. Pijnappel proposed, in the name of Holland, that a permanent bureau of the International Congress on Hygiene and Demography be established at The Hague, and he referred to the permanent bureaus now in existence there representing other international medical congresses. He stated that he was confident that the Netherland Government would supply the funds required for the maintenance of such a bureau for the first year of its existence, and pending the obtaining of the necessary funds for its permanent maintenance from other sources. He stated that he believed the annual expense would not exceed 8,000 francs. His resolution was adopted after discussion.

Resolutions referred to the Permanent International Commission from the last session concerning (1) construction of public baths and baths in factories, and (2) concerning fatigue through work, were presented by the president.

Resolution proposed by A. Herzberg and O. Lassar (Berlin) in Section IV of the Fourteenth International Congress on Hygiene and Demography, Berlin, 1907:

1. The improvement and propagation of public baths are a cultural task of practical hygiene and ought to stand everywhere in the foreground of public interest.

2. The general building regulations must be completed to the effect that in future no building for tenements for several families may be constructed without sufficient bathing accommodation.

3. The provision of bathing and washing accommodation in railway stations is an urgent requirement for the traveling public. Especially the accommodation for washing the hands in railway stations and trains ought to be looked upon everywhere as a primary necessity; means for drying the hands must, of course, also be provided in the most suitable manner possible.

Resolution proposed by Herr Bielefeldt, of Lübeck, in Section IV of the Fourteenth International Congress on Hygiene and Demography, Berlin, 1907:

Considering that the capacity is not only individually different, but is also subject to considerable variations and modifications during the life of the individual, permanent medical control, with due regard to the capacity in each individual case, ought to take place in all establishments requiring physical and mental exertion, inclusive of all large commercial establishments, and all plants where the workmen are threatened by danger connected with the work.

After discussion, both of these resolutions were laid on the table.

The commission then adjourned to meet again on Saturday morning, September 28, in Continental Memorial Hall, at 9 o'clock.

Prof. RUBNER, *President.*

JOHN S. FULTON, *Secretary.*

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SECOND MEETING OF THE PERMANENT INTERNATIONAL COMMISSION.

The second meeting of the Permanent International Commission of Congresses on Hygiene and Demography was held in Continental Memorial Hall, Washington, D. C., on Saturday morning, September 28, 1912, at 9 o'clock, Geheimrat Prof. Dr. Rubner, president, in the chair.

President Rubner presented the following resolutions, which were adopted:

The Permanent Committee of International Congresses on Hygiene and Demography submits the following resolution to the Fifteenth International Congress on Hygiene and Demography:

That the Fifteenth International Congress on Hygiene and Demography instruct the Permanent Committee of the International Congresses on Hygiene and Demography to take all necessary steps for the creation, at The Hague, of a permanent bureau for the International Congresses on Hygiene and Demography.

Resolution Recommended by Section I.

Resolved, That this congress approves the proposal made by the section of microbiology and applied parasitology that an international committee be appointed to consider the methods of investigation, classification, and differentiation of the organisms of the colon-typhoid group, with the view of securing greater uniformity in such methods and of adopting as a provisional standard certain tests which shall be recommended for the investigation of organisms belonging to this group.

Resolutions Recommended by Section IV.

Resolved, That for the important object of securing the highest degree of practical utility in the notification, tabulation, and analysis of the official returns of occupational diseases it is recommended that such notification and returns should be made in a uniform manner by international agreement.

Resolved further, That such nations and states which do not as yet provide for a compulsory notification of occupational diseases are earnestly urged to do so at the earliest opportunity.

Resolutions Recommended by Section V.

I. That the disinfectants used in different countries should be controlled by a simple bacterial test capable of being easily effected, and that a committee from this congress do confer with a committee of the International Congress on Applied Chemistry to define such test.

II. That the Permanent International Commission of the Congresses on Hygiene and Demography be requested to appoint a committee of not less than five members to represent this congress for this purpose.

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Resolutions Recommended by Section VIII: Military, Naval, and Tropical Hygiene.

Whereas the medical departments of the several navies have no uniform methods for expressing morbidity or mortality statistics either in nomenclature for causes of disability or in compilations and tabulations of returns; and

Whereas the International Classification of Causes of Death and Sickness should form a basis to secure uniformity in all naval vital statistics: Therefore be it

Resolved, That the secretary general of the Fifteenth International Congress on Hygiene and Demography, now in session in Washington, is directed to communicate to the Governments of France, Germany, Great Britain, Italy, Russia, Japan, the United States of America, and such other Nations as publish naval medical returns, that it is the sense of this congress that each Government should designate naval medical representatives to confer and recommend uniform methods and tables for expressing internationally naval vital statistics.

Resolutions Recommended by Section IX.

I. The congress desires that in every country the statistics of births, deaths, marriages, and divorces may be published periodically and, if practicable, annually.

II. 1. The congress believes that countries, States, or large cities which publish demographic statistics need registrars or similar officers sufficiently trained in medicine and demography and able properly to interpret demographic statistics, especially those of the causes of death.

2. The congress believes that provision for the training and opportunity for the appointment and retention of such men are of fundamental importance in public-health work.

III. 1. The congress desires that family statistics, including those of children born and children living, be gathered periodically in connection with the census.

2. The congress desires that, in connection with the registration of births, information be gathered showing the order of this birth in the family.

3. The congress desires that, in connection with the registration of deaths of married or widowed or divorced persons, information be gathered regarding the children, if any, of the decedent.

IV. 1. The congress desires that, in every country, criminal statistics may be published periodically and, if possible, annually.

2. The congress desires that a commission be appointed to report upon the subject of uniformity in criminal statistics, especially a uniform nomenclature.

3. The congress desires that the International Statistical Institute, at its meeting in Vienna in 1913, be invited to cooperate in the examination of this subject.

V. The congress urges the demographers of the several countries to pay especial attention to the influence of occupation upon mortality.

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The following resolutions suggested by Section III and Section IV of the congress were laid upon the table:

Section III.—Hygiene of infancy and childhood: School hygiene.

Dr. Thomas F, Harrington, Director, School of Hygiene, Boston, Mass., offers the following resolutions:

Whereas the keynote of the Fifteenth International Congress on Hygiene and Demography in promoting and in conserving health is education, cooperation, and organization; and

Whereas these means may be effectively fostered by a united intensive concentration upon a definite plan of action elastic enough to meet the needs of all: Therefore be it

Resolved, That the Fifteenth International Congress on Hygiene and Demography designates the first Friday in October to be known as Health Day, to be observed annually by schools, municipalities, armies, and navies throughout the world as a means by which the prevention of preventable diseases and accidents may be learned and the cure of curable diseases intelligently appreciated: And further be it

Resolved, That in the observance of Health Day all available resources of the home and of the school, of the teaching and of the medical professions, of the municipalities, of the State, and of official organizations be fostered and utilized in each locality.

Resolved, That the Permanent International Commission of the Congresses on Hygiene and Demography be instructed to forward to national committees and to official delegates a copy of these resolutions as a part of the official report to governments, organizations, and institutions represented at the Fifteenth International Congress on Hygiene and Demography.

Section IV recommends the adoption of the following resolutions:

Resolved, That all physiological and pathological studies of occupational diseases be conducted by persons who, in addition to a medical education, possess a practical knowledge of sanitary science with special reference to the hygiene of occupations.

Resolved further, That in the prevention of occupational diseases the subject of factory sanitation be supplemented by measures providing for general education in personal and occupational hygiene, and in the improvement of the housing conditions, food, and community life of the employees.

Dr. Welch proposed Dr. Hermann M. Biggs, president of Section V, of New York, as an American member of the Permanent International Commission. Proposal was adopted.

Dr. Rubner announced that he had received an invitation from the city of San Francisco for the next congress to meet in that city; also one from Brazil, to meet in the city of Rio de Janeiro. He said that he had reason to believe that an invitation for the next Congress on Hygiene and Demography would be extended by the Russian Government, either at Moscow or St. Petersburg. He did not deem it wise to definitely determine a place of meeting until such official invitation had been received. The place and date of the next meeting of the International Congress were again left to the president of the

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Permanent International Commission, after correspondence with the members.

The president announced the receipt of a letter from Dr. Luigi Pagliani, announcing his inability to be present at the present session of the Permanent Commission, and proposing that the Italian language be added to the list of the official languages of the congress.

Signor Presidente della Commissione internazionale per i Congressi di Igiene e Demografia:

Sono molto spiacente di non avere assistito alla prima riunione della commissione da V. S. così degnamente presieduta, per non essere stata chiara la indicazione dell' ora nella lettera d' invito. Chiedo anche scusa a Lei ed agli egregi colleghi se non posso trovarmi presente alla seconda di domani, dovendo lasciare Washington per impegno che non posso differire.

Sono pienamente d' accordo riguardo alla decisione che la commissione sara per prendere intorno alla costituzione di uno uffizio permanente all' Aja (Olanda), e intorno alla prossima sede del congresso a Mosca od a Rio Janeiro, secondo V. S. giudichera meglio. Saro lieto se V. S. vorra tenermi presente alla seduta.

Ho una preghiera a rivolgere a V. S. ed ai colleghi riferentesi al riconoscimento della lingua italiana come lingua ufficiale dei nostri congressi, allo stesso modo che lo sono la francesa, la tedesca e l' inglese, riconoscimento che e vivamente desiderato dal mio paese. Io sono certo che Ella ed i colleghi vorranno benevolmente considerare che l' Italia ha preso una buona posizione fra la sua legislazione e organizzazione sanitaria, che per l' opera data dai suoi uomini di scienza, al progresso della cognizione nella materia e che merita di essere in riguardo tenuta in pregio fra le migliori. D'altra parte V. S. ed i colleghi, sono certo, troveranno giusto che la lingua parlata dal paese che ha Roma per capitale, e che e figlia primogenita del latino, alla cui letteratura ogni uomo di scienza si ispira, non può essere tenuta in seconda fila respetto alle altre lingue, che in tutto o in parte hanno la stessa derivazione.

Io sono certo che V. S. ed i colleghi accoglieranno favorevolmente questa mia preghiera, che fu, in tanto, già soddisfatta per l' attuale Congresso di Washington per cortesia della sua presidenza, ed io ne esprimo vivissimi ringraziamenti da parte del Governo e degli igienisti del mio paese.

Colla maggiore cordiale devozione,

Prof. L. PAGLIANI,
Membro della Commissione permanente dei Congressi di Igiene e di Demografia.

Dr. Welch suggested that the question of determining what languages other than the French, German, and English should be used as official languages of the congress might well be left to be determined by the local committee on organization in the country where the next session of the congress was to be held.

Dr. Nuttall, of Great Britain, was opposed to any proposition to increase the number of official languages, and he added that the Italian members are perfectly free to use their own language in their addresses and in the discussions of the congress. No action was taken upon the proposition.

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President Rubner announced the following nominations for membership in the committee of the International Congress on Hygiene and Demography to consider the preparation of a standard method of testing disinfectants, the committee to have power to consult with the committee of the International Congress on Applied Chemistry, appointed for the same purpose:

For chairman:

Geheimer Regierungsrat, Dr. Weber, Germany.

For members:

Dr. John F. Anderson, Hygienic Laboratory of the United States Public Health Service, Washington, D. C.

Dr. Thorvald Madsen, Statens Serum Institut, Copenhagen, Denmark.

Dr. R. T. Hewlett, Kings College, London, England.

An Italian member to be appointed later.

A representative of the Pasteur Institute, Paris, France, to be announced later.

Dr. Nuttall proposed that a special committee of the Permanent Commission be appointed to aid the chairman in the organization of the proposed permanent bureau of the Congresses on Hygiene and Demography at The Hague. Dr. Welch seconded the motion and it was adopted. The president thereupon appointed Dr. S. N. D. North, Dr. E. M. W. Pynappel, of Holland, and Dr. G. H. F. Nuttall.

The Permanent International Commission thereupon adjourned.

Prof. RUBNER, *President.*

JOHN S. FULTON, *Secretary.*

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PERMANENT INTERNATIONAL COMMISSION OF THE CONGRESSES ON HYGIENE AND DEMOGRAPHY.

PRESIDENT:

Geheimer Medizinalrat Prof. Dr. Max Rubner, Director of the Institute of Hygiene, University of Berlin, Germany.

VICE-PRESIDENTS:

Dr. André Chantemesse, Professor of Hygiene, Faculty of Medicine, Inspector-General, Sanitary Service, Ministry of the Interior, Paris, France.

Dr. S. N. D. North.

Membres de droit.

DR. A. J. MARTIN, Membre Conseil Supérieur d'hygiène publique de France, Paris, France.

DR. W. H. DE BEAUFFORT, Membre 2e Chambre des Etats Généraux, Utrecht, Holland.

DR. KOLOMAN MÜLLER, University Professor; President Landessanitätsrat, Budapest, Hungary.

PROF. CARLOS CALLEJA Y BORJA-TARRIUS, Professor Histology, University Barcelona, Barcelona, Spain.

M. EMILE BECO, President Conseil Supérieur d'hygiène publique Belgique, Brussels, Belgium.

DR. FÉLIX PUTZEYS, Professor Hygiene, University Liège, Member Superior Board of Health, Liège, Belgium.

HEINRICH PRINZ ZU SCHOENAICH-CAROLATH, Member Reichstag, Amtitz.

DR. JOHANNES NIETNER, Professor, Secretary-General Deutsche Centralkomitee z. Bekämpfung der Tuberkulose, Berlin, Germany.

DR. JOHN S. FULTON, Secretary State Department of Health of Maryland, Professor of State Medicine, University of Maryland, Baltimore.

AUSTRIA.

PROF. DR. FERDINAND HÜPPE, Obersanitätsrat, Prag.

BELGIUM.

M. MAURICE SAUVEUR, Director-General Royal Bureau of Statistics, Brussels (Demography).

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BRAZIL.

Dr. Bruno Chaves, Ambassador for Brazil, Rome, Italy.

CUBA.

Dr. Aristides Agramonte, Professor of Bacteriology and Pathology, University of Habana, Habana.

DENMARK.

Dr. E. M. Hoff, Medical Officer of Health, Copenhagen.

FRANCE.

Prof. Georges Bechmann, Engineer-in-Chief of Roads and Bridges, Paris.

Dr. André Chantemesse, Professor of Hygiene, Faculty of Medicine, Inspector-General Sanitary Service, Ministry of the Interior, Paris.

Dr. Albert Calmette, Professor Hygiene, Faculty of Medicine of Lille, Member Superior Board of Health, Lille (Nord).

Prof. Dr. Langlois, Professor of Physiology, Paris.

M. Lucien March, Chef de la Statistique général au Ministere du Travail, Paris.

GERMANY.

Prof. Dr. Friedrich Loeffler, Director of the Institute of Hygiene, Greifswald.

Prof. Dr. Georg Gaffky, Director of the Royal Institute for Infectious Diseases, Berlin.

Prof. Dr. Max Gruber, Director of the Institute of Hygiene, Munich.

Prof. Dr. Ernst Bumm, President Imperial Board of Health, Berlin.

Prof. Dr. Georg von Mayr, Professor of Statistics and Political Economy, Munich.

Prof. Dr. Ernst Mischler, Chief of the Imperial Statistical Bureau of Germany, Berlin.

GREAT BRITAIN.

Dr. G. H. F. Nuttall, Professor of Biology, University of Cambridge, Cambridge.

Mr. Alfred H. Roechling, Civil Engineer, London.

Dr. Theodore Thomson, Asst. Medical Officer, Local Government Board, London.

Dr. Arthur Newsholme, Chief Medical Officer, Local Government Board, London.

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GREECE.

DR. CONSTANTIN SAVAS, Professor of Hygiene and Bacteriology, Director of the Institute of Hygiene, Athens.

HOLLAND.

DR. W. P. RUYSCH, Inspector-General, Sanitary Service, Member of the Superior Board of Health, The Hague.

PROF. C. H. SPRONCK, Professor of Pathology, Utrecht.

HUNGARY.

PROF. DR. LEO. VON LIEBERMANN, Budapest.

PROF. DR. GUSTAV THIRRING, Budapest (Demography).

ITALY.

DR. LUIGI PAGLIANI, Professor of Hygiene, Director of the Institute of Hygiene, Turin.

SENATOR LUIGI BODIO, President of the Superior Board of Statistics, Rome (Demography).

JAPAN.

PROF. TEIZO MATSUCHITA, Director of the Institute of Hygiene, Kyoto.

MEXICO.

PROF. NICOLAS RAMIREZ DE ARELLANO, Member of Board of Health, Professor of Legal Medicine, Mexico.

NORWAY.

DR. AXEL JOHANNESEN, Professor Pediatrics, Kristiania.

ANDERS N. KIAER, Director Central Bureau of Statistics, Kristiania.

RUSSIA.

DR. J. DE RAPTCHEWSKI, Councillor of Military Hygiene, St. Petersburg.

DR. GREGOREVICH, Director of the Imperial Bureau of Statistics, St. Petersburg.

DR. SIMON VON UNTERBERGER, Honorary Physician to His Majesty's Court, St. Petersburg.

SPAIN.

DR. CARLOS M. CORTEZO Y PRIETO, Vice-President, Royal Board of Health, Madrid.

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SWEDEN.

PROF. ERNST ALMQUIST, Director, Hygienic Institute, Stockholm.

SWITZERLAND.

DR. FRIEDRICH ERISMANN, Professor Sanitary Service, Zürich.
DR. SCHMID, Director, Swiss Board of Health, Bern.
DR. GUILLAUME, Director Federal Statistical Bureau, Bern (Demography).

UNITED STATES.

DR. S. N. D. NORTH, Statistician, Carnegie Peace Foundation, Washington, D. C.
LIEUT.-COL. WALTER D. MCCAW, Medical Department, United States Army, Washington, D. C.
DR. RUPERT BLUE, Surgeon General, United States Public Health Service, Washington, D. C.
DR. HERMANN M. BIGGS, Medical Director, City Department of Health, New York City.

Membres Adjoints.

PROF. EMILE VAN ERMENGEM, Professor of Hygiene and Bacteriology, Gand, Belgium.
PROF. J. P. DEPAIRE, Professor Honoraire, University Gand, Belgium.
LIEUT.-GEN. GUSTAVE CHARLES F. DOCTEUR, Brussels, Belgium.
M. C. H. B. RAEMAECKERS, Secretary General, Ministry of Railroads, Brussels, Belgium.
BARON WAHIS, Governor General of the Independent State of the Congo, Schaerbeck, Belgium.

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REGULATIONS OF THE CONGRESS.

ARTICLE I.

The Fifteenth International Congress on Hygiene and Demography will meet in Washington from the 23d to the 28th of September, 1912.

ARTICLE II.

The purpose of the congress is to promote the knowledge and practice of hygiene and demography.

ARTICLE III.

Any person engaged in the study or practice of hygiene or demography may become a member of the congress. But the committee on organization reserves the right to withhold the privileges of membership in particular cases.

ARTICLE IV.

The fee for membership is $5 (20 marks=25 francs).

Relatives of members of the congress, as well as students of colleges and universities, who are not eligible for membership, may become associate members, and may have the privileges of attending the meetings of the congress, and participating in the entertainments, excursions, and other events occurring in connection with the congress; but may not vote or participate in the discussions or receive the transactions.

These associate members shall pay a fee of $2.50 (10 marks).

ARTICLE V.

Each member will receive a report of the transactions of the congress, and of the protocol, to be published after the adjournment of the congress.

ARTICLE VI.

The congress is divided into two divisions and nine sections.

I. HYGIENE.

Section 1. Hygienic Microbiology and Parasitology.
Section 2. Dietetic Hygiene. Hygienic Physiology.
Section 3. Hygiene of Infancy and Childhood: School Hygiene.
Section 4. Industrial and Occupational Hygiene.
Section 5. Control of Infectious Diseases.
Section 6. State and Municipal Hygiene.
Section 7. Hygiene of Traffic and Transportation.
Section 8. Military, Naval, and Tropical Hygiene.

II. DEMOGRAPHY.

Section 9. Demography.

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Article VII.

The sessions are divided into general sessions and section sessions. The opening and closing meetings are general sessions. Joint meetings may be arranged between two sections.

The official languages of the congress are English, French, and German.

Article VIII.

The congress is governed by a president, two vice presidents, and secretaries.

Each section is governed by a president, vice presidents, and secretaries.

During the general session for opening the congress the reports of the committee on organization will be acted upon, and honorary presidents of the congress elected.

During the first session of each section the nominations by the president of the section will be received, and honorary presidents of the section will be elected.

The president of each section shall be responsible for the government of his section throughout the meeting of the congress; but the president of a section may, at his own discretion, relinquish the chair temporarily to any of the honorary presidents of the section.

Article IX.

The committee on organization will receive from the presidents of sections suggestions as to themes for discussion, and the names of referees and coreferees, and will arrange the program for each of the sections. The discussion of each theme will be opened and closed by the referee and coreferees chosen for that purpose.

Article X.

Each referee or coreferee must send a short summary or abstract of his communication to the secretary general of the congress before June 1, 1912, so that the abstracts may be sent to the members of the congress in advance of the meeting.

Each referee or coreferee has a maximum time allowance of 20 minutes for the presentation of his paper. After the stated papers are read, the subject will be open for general discussion.

Article XI.

Notice of the desire to present a paper or a demonstration must be sent to the president of the appropriate section, enclosing an abstract or brief account of the proposition. The presidents of sections will

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dispose of these requests in the order of their receipt, and in such a way as not to interfere with the discussion of the official themes.

Article XII.

Each speaker, who desires his remarks to be published in the transactions, must hand to the secretary of the section, at the close of the session, a typewritten manuscript of his part in the discussion.

Each section secretary will make a written report of each session, will take possession of the papers read and the records of discussions, and will hand to the president of the section an orderly account of the section proceedings, to be approved by the president and transmitted to the secretary general for publication in the transactions.

Article XIII.

The congress will not pass resolutions on scientific questions, but the sections have the right to offer formal propositions, which may be acted upon by the congress at the closing session, provided the Permanent International Commission of the Congress on Hygiene and Demography makes no objection.

Article XIV.

While the congress is in session a printed journal will appear daily, giving the program as arranged by the presidents of sections, and other information of interest to members of the congress.

Article XV.

At the closing session the report of the Permanent International Commission is received, and the time and place of the next meeting of the congress is decided.

During the closing sessions, the proposals offered by the sections are acted upon.

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RÈGLEMENT DU CONGRÈS.

Article I.

Le XV^me^ Congrès International d'Hygiène et de Démographie aura lieu à Washington du 23^me^ septembre au 28^me^ septembre, 1912.

Article II.

Le but du Congrès est l'avancement scientifique et pratique de l'Hygiène et de la Démographie.

Article III.

Peuvent faire partie du Congrès en qualité de membres toutes personnes qui s'occupent de l'hygiène et de la démographie d'une manière scientifique ou pratique; mais le comité d'organisation se reserve le droit de refuser toute demande d'adhésion qui ne paraîtrait pas suffisamment justifiée.

Article IV.

La cotisation est fixée à 25 francs ($5=20 marcs).

Peuvent y participer à titre d'associés les personnes de la famille d'un membre du Congrès qui ne pourraient elles-mêmes être membres du Congrès, ainsi que les élèves de toutes les Facultés.

Les membres associés ont le droit d'assister aux séances du Congrès et de prendre part aux fêtes, excursions, et cetera. Ils ne prennent pas part aux discussions et n'ont pas de voix.

La cotisation des membres associés est fixée à 12.5 francs ($2.50=10 marcs).

Article V.

Tout membre du Congrès recevra un exemplaire des rapports imprimés et un exemplaire des comtes-rendus des travaux qui seront publiés après le Congrès.

Article VI.

Le Congrès formera deux divisions et neuf sections.

I.

Section 1.—Microbiologie et parasitologie appliquées a l'hygiène.
Section 2.—Hygiène alimentaire et physiologie appliquée a l'hygiène.
Section 3.—Hygiène de l'enfance; hygiène des écoles.
Section 4.—Hygiène professionnelle; hygiène industrielle.
Section 5.—Lutte contre les maladies infectieuses.
Section 6.—Hygiène publique; hygiène municipale.
Section 7.—Hygiène du service des transports en commun.
Section 8.—Hygiène militaire, navale, tropicale.

II.

Section 9.—Démographie.

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ARTICLE VII.

Les séances du Congrès seront divisées en séances générales et en séances de sections. Il y aura deux séances générales dont l'une sera tenue le jour de l'ouverture, et l'autre le jour de la clôture. De plus plusieurs sections peuvent se reunir en séances communes.

Les langues officielles du Congrès seront l'anglais, le français et l'allemand.

ARTICLE VIII.

Le Bureau du Congrès sera composé du Président, de deux Vice-présidents et des Secrétaires.

Chaque Bureau de Section sera composé d'un Président, d'un Vice-président et des Secrétaires.

Les Présidents d'honneur du Congrès seront nommés dans la séance d'ouverture sur la proposition du Comité d'Organisation.

Dans la première séance de chaque section les Présidents d'honneur des Sections seront nommés sur la proposition du Président de la section en question.

Le Président désigné reste responsable de la direction de sa section pendant toute la durée du Congrès.

Le Président d'une section est autorisé de céder la présidence temporairement à un des Présidents d'honneur de sa section.

ARTICLE IX.

Le Comité d'Organisation recevra des suggestions des Présidents des Sections concernant les sujets des discussions, et les noms des rapporteurs et corapporteurs et arrangera le programme de chaque section. La discussion de chaque sujet sera ouverte et conclue par le rapporteur et corapporteur désignés.

ARTICLE X.

Chaque rapporteur et corapporteur est obligé d'envoyer son rapport aussi court que possible ou un résumé au Secrétaire général du Congrès jusqu'au 1er Juin 1912, afin que ces résumés puissent être envoyés aux members avant la réunion du Congrès.

Vingt minutes tout au plus sont accordées a chacun des rapporteurs. Après la présentation des rapports le sujet est soumis à une discussion générale.

La parole est donnée aux orateurs d'après l'ordre de leur inscription annoncée préalablement par écrit au Bureau général.

Cinq minutes sont accordées à chaque orateur pour la discussion et il n'est permis à aucun orateur de dépasser cinq minutes sans la permission de la section.

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Personne ne doit prendre la parole plus deux fois sur la même question sans la permission de la section.

Après la discussion générale cinq minutes seront accordées aux rapporteurs et corapporteurs pour la réplique finale.

Article XI.

Tout membre du Congrès qui désire présenter un discours ou une démonstration dans l'une des sections doit en adresser la demande, accompagnée d'un résumé du sujet, au Président de la section intéressée. Le Président de la section disposera de ces discours et démonstrations d'après l'ordre de leur inscription en tant que les débats des questions officielles y laissent encore du temps.

Article XII.

Chaque orateur, qui désire que son discours soit publié dans les comptes-rendus, doit à la fin de la séance, en remettre une copie écrite à la machine au Secrétaire de la section.

Le Secrétaire de chaque section doit faire un procès-verbal de sa section; il gardera les manuscrits des discours et doit composer un rapport régulier des procédés de sa section, qui sera approuvé par le Président et remis au Secrétaire général afin d'être publié dans les comptes-rendus.

Article XIII.

Le Congrès ne formera pas des résolutions sur des questions scientifiques, mais les sections ont le droit de formuler des propositions, qui seront soumis au Congrès dans la séance de clôture, pourvu que la Commission Permanente Internationale du Congrès d'Hygiène et de Démographie n'y fasse pas objection.

Article XIV.

Pendant la durée du Congrès un journal paraîtra tous les jours, dans lequel l'ordre du jour fixé par les Présidents des divers sections sera publié, ainsi que d'autres informations concernant le Congrés.

Article XV.

Dans la séance de clôture le Congrès fixera, sur la proposition de la Commission Permanente Internationale, le siège et la date de sa prochaine réunion; il décidera en même temps de l'acceptation ou du rejet des propositions présentées par les sections.

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KONGRESSORDNUNG.

Artikel I.

Der Fünfzehnte Internationale Kongress für Hygiene und Demographie findet in der Zeit vom 23. bis 28. September, 1912, in Washington statt.

Artikel II.

Zweck des Kongresses ist die wissenschaftliche und praktische Förderung der gesamten hygienischen und demographischen Bestrebungen.

Artikel III.

Mitglied des Kongresses kann jeder werden, Herr oder Dame, der sich wissenschaftlich oder praktisch mit der Hygiene und der Demographie beschäftigt. Das Organisations-Komitee behält sich aber das Recht vor, ungeeignet erscheinende Personen von der Mitgliedschaft auszuschliessen.

Artikel IV.

Der Mitgliedsbeitrag beträgt $5.00 (20 Mark, 25 Francs). Angehörige der Kongressmitglieder wie Besucher der wissenschaftlichen Hochschulen, welche zur aktiven Mitgliedschaft nicht berechtigt sind, können als passive Mitglieder zugelassen werden. Als solche sind dieselben berechtigt, den Sitzungen, Unterhaltungen, wissenschaftlichen Ausflügen und sonstigen Veranstaltungen des Kongresses beizuwohnen, dürfen aber nicht an den Diskussionen und Abstimmungen teilnehmen.

Der Beitrag für diese passiven Mitglieder beträgt $2.50 (10 Mark).

Artikel V.

Jedes Mitglied erhält je ein Exemplar der vor dem Kongress gehaltenen Vorträge und der Sitzungs-Protokolle, die nach dem Schluss des Kongresses gedruckt werden.

Artikel VI.

Der Kongress gliedert sich in zwei Abteilungen oder neun Sektionen.

I. Abteilung.

Sektion 1.—Hygienische Mikrobiologie und Parasitologie.
Sektion 2.—Ernährungs-Hygiene und hygienische Physiologie.
Sektion 3.—(*a*) Hygiene des Säuglings- und Kindesalters.
(*b*) Hygiene der Schule.
Sektion 4.—Berufs-Hygiene und Fürsorge für die arbeitenden Klassen.
Sektion 5.—Bekämpfung der Infektionskrankheiten.
Sektion 6.—Städtische und staatliche Hygiene.
Sektion 7.—Hygiene des Verkehrs- und Transportwesens.
Sektion 8.—Militär-, Schiffs- und Tropen- Hygiene.

II. Abteilung.

Sektion 9.—Demographie.

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ARTIKEL VII.

Die Sitzungen zerfallen in allgemeine und Sektions-Sitzungen. Die Eröffnungs- und die Schluss-Sitzung sind allgemeine Sitzungen. Ausserdem können gemeinschaftliche Sitzungen verschiedener Sektionen statt finden. Die offiziellen Sprachen auf dem Kongress sind Englisch, Französisch und Deutsch.

ARTIKEL VIII.

Die Kongressleitung besteht aus einem Präsidenten, zwei Vice-Präsidenten und einem General-Sekretäre.

Jede Sektion wird geleitet von einem Präsidenten, von Vice-Präsidenten und Sekretären.

In der allgemeinen Eröffnungssitzung werden auf Vorschlag des Organisations-Komitees Ehrenpräsidenten des Kongresses ernannt.

In der ersten Sitzung jeder Sektion findet die Wahl von Ehrenpräsidenten der Sektion statt auf Vorschlag des Präsidenten der Sektion.

Die verantwortliche Leitung der Sektion bleibt in der Hand des bestellten Präsidenten während der ganzen Tagung des Kongresses.

Der Präsident ist berechtigt, den Vorsitz der Verhandlungen der Sektion jeweilig der gewählten Ehrenpräsidenten der Sektion zu übertragen.

ARTIKEL IX.

Das Organisations-Komitee empfängt von jedem Präsidenten der neun Sektionen Vorschläge über die Diskussions-Themata wie die Namen der Referenten und Korreferenten, und wird ferner das Programm aufstellen für jede dieser Sektionen. Jede Diskussion wird eingeleitet und beschlossen durch den für dieses Thema erwählten Referenten und Korreferenten.

ARTIKEL X.

Jeder Referent und Korreferent muss bis zum 1. Juni 1912 ein kurz gefasstes Referat oder einen Auszug desselben an den General-Sekretär des Kongresses einsenden, damit diese den Mitgliedern des Kongresses noch vorzeitig vor dem Zusammentreten des Kongresses übermittelt werden können.

Für das einleitende Referat stehen den Referenten und Korreferenten höchstens je zwanzig Minuten zur Verfügung. Nach Beendigung des Referats und Korreferats wird das Thema zur Diskussion gestellt.

Die Reihenfolge der Vorträge richtet sich nach der Zeitfolge ihrer Anmeldung bei dem Bureau.

In der Diskussion stehen jedem Redner fünf Minuten zur Verfügung; und kein Redner darf diese Zeit überschreiten ohne spezielle Erlaubnis der Sektion.

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Mehr als zweimal darf niemand bei demselben Gegenstand das Wort ergreifen, falls nicht die Sektion dazu spezielle Erlaubnis erteilt.

Nach Beendigung der allgemeinen Diskussion steht dem Referenten und dem Korreferenten ein Schlusswort von fünf Minuten zu.

Artikel XI.

Anmeldungen von Vorträgen und Demonstrationen sind an den Präsidenten der betreffenden Sektion zu richten unter Beifügung eines kurzen Referats oder Auszugs. Die Präsidenten der Sektionen werden diese Vorträge und Demonstrationen nach der Zeitfolge ihrer Anmeldung berücksichtigen, wofern sie nicht in die Diskussion der offiziellen Themata störend eingreifen.

Artikel XII.

Jeder Redner, der wünscht, dass das von ihm Vorgetragene in den Verhandlungen des Kongresses erscheinen soll, muss dem Sekretär der Sektion nach Schluss der Sitzung ein mit dem Schreib-Apparat geschriebenes Manuscript seines Vortrages überreichen.

Der Sekretär einer jeden Sektion muss über jede Sitzung ein Protokoll führen, hat ferner die Manuscripte der gehaltenen Vorträge in Verwahrung zu nehmen und muss dem Präsidenten der Sektion ein vollständiges Protokoll der Verhandlungen der betreffenden Sektion überreichen, das unterzeichnet durch den Präsidenten der Sektion dem General-Sekretär des Kongresses für die Drucklegung der Verhandlungen übergeben werden muss.

Artikel XIII.

Beschlussfassungen über wissenschaftliche Fragen finden nicht statt, aber die Sektionen sind berechtigt, Vorschläge zu formulieren, über die in der Schluss-Sitzung des Kongresses abgestimmt werden kann, wofern die Permanente Internationale Kommission des Kongresses für Hygiene und Demographie keinen Einwand erhebt.

Artikel XIV.

Während der Tagung des Kongresses erscheint ein Tageblatt, in welchem die von den Präsidenten festgesetzten Tagesordnungen der Sektionen, wie andere Mitteilungen von Interesse für die Mitglieder des Kongresses mitgeteilt werden.

Artikel XV.

In der Schluss-Sitzung nimmt der Kongress den Bericht der Permanenten Internationalen Kommission entgegen, und bestimmt Ort und Zeit des nächsten Kongresses. Auch wird in der Schluss-Sitzung über die von den Sektionen gemachten Vorschläge abgestimmt.

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FINAL SESSION CLOSING THE FIFTEENTH INTERNATIONAL CONGRESS ON HYGIENE AND DEMOGRAPHY.

[Held at Continental Memorial Hall, Washington, D. C., Saturday, September 28, 1912.]

The closing session of the Fifteenth International Congress on Hygiene and Demography was held in Continental Memorial Hall, Washington, on Saturday morning, September 28, 1912, at 11 o'clock.

The president, Dr. Henry P. Walcott, called the congress to order, and called upon Prof. Max Rubner for his report as president of the Permanent International Commission of Congresses on Hygiene and Demography.

Prof. Rubner announced the following changes in the membership of the Permanent International Commission:

Prof. Andrè Chantemesse, to be vice president in place of Prof. Roux, resigned.

Prof. Dr. Ernst Mischler, to represent demography, in place of Dr. Van der Borght, resigned.

Prof. Dr. Langlois, of Paris, as an additional member representing France.

Dr. Gregorevich, director of the Imperial Institute of Statistics of Russia, to represent demography.

Mons. Lucien March, director of the general statistics of France, to fill the vacancy caused by the death of M. Emile Levasseur.

Dr. Rupert Blue, Surgeon General of the United States Public Health Service, to succeed Dr. William H. Welch, resigned.

Dr. Hermann M. Biggs, medical director of the department of health, of New York City, as an additional member representing the United States.

Prof. Rubner presented a resolution, proposed by the Permanent International Commission, for the purpose of creating a Permanent Bureau for International Congresses on Hygiene and Demography, to be located at The Hague.

> The Permanent Committee of International Congresses on Hygiene and Demography submits the following resolution to the Fifteenth International Congress on Hygiene and Demography:
>
> That the Fifteenth International Congress on Hygiene and Demography instruct the Permanent Committee of the International Congresses on Hygiene and Demography to take all necessary steps for the creation, at The Hague, of a permanent bureau for the International Congresses on Hygiene and Demography.

The president asked the will of the congress on the resolution as read, and, without objection, declared it adopted.

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Prof. Rubner presented the following resolutions, proposed by the sections and approved by the Permanent International Commission:

RESOLUTION PROPOSED BY SECTION I.

Resolved, That this congress approves the proposal made by the section on microbiology and applied parasitology that an international committee be appointed to consider the methods of investigation, classification, and differentiation of the organisms of the colon-typhoid group, with the view of securing greater uniformity in such methods and of adopting as a provisional standard certain tests which shall be recommended for the investigation of organisms belonging to this group.

The resolution was adopted by the congress.

RESOLUTIONS PROPOSED BY SECTION IV.

Resolved, That for the important object of securing the highest degree of practical utility in the notification, tabulation, and analysis of the official returns of occupational diseases it is recommended that such notification and returns should be made in a uniform manner by international agreement.

Resolved, further, That such nations and states which do not as yet provide for a compulsory notification of occupational diseases are earnestly urged to do so at the earliest opportunity.

The congress adopted the resolutions of Section IV.

RESOLUTIONS PROPOSED BY SECTION V.

Resolved, I. That the disinfectants used in different countries should be controlled by a simple bacterial test capable of being easily effected, and that a committee from this congress do confer with a committee of the International Congress on Applied Chemistry to define such test.

II. That the Permanent International Commission of Congresses on Hygiene and Demography be requested to appoint a committee of not less than five members to represent this congress for this purpose.

Prof. Rubner nominated six persons for membership in the committee of The International Congress on Hygiene and Demography to consider the preparation of a standard method of testing disinfectants, the committee to have the power to consult with the committee of the International Congress on Applied Chemistry appointed for the same purpose.

For chairman:

Geheimer Regierungsrat Dr. WEBER, Berlin, Germany.

For members:

Dr. JOHN F. ANDERSON, Hygienic Laboratory, United States Public Health Service, Washington, D. C.

Dr., THORVALD MADSEN, Statens Serum Institut, Copenhagen, Denmark.

Dr. R. T. HEWLETT, Kings College, London, England.

A representative of Italy to be appointed later.

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A representative of the Pasteur Institute, Paris, France, to be announced later.

The recommendations of the Permanent International Commission were adopted by the congress, and the nominations were approved.

RESOLUTIONS PROPOSED BY SECTION VIII: MILITARY, NAVAL, AND TROPICAL HYGIENE.

Whereas the medical departments of the several navies have no uniform methods for expressing morbidity or mortality statistics either in nomenclature for causes of disability or in compilations and tabulations of returns; and

Whereas the International Classification of Causes of Death and Sickness should form a basis to secure uniformity in all naval vital statistics: Therefore be it

Resolved, That the secretary general of the Fifteenth International Congress on Hygiene and Demography, now in session in Washington, is directed to communicate to the Governments of France, Germany, Great Britain, Italy, Japan, Russia, the United States of America, and such other nations as publish naval medical returns, that it is the sense of this congress that each Government should designate naval medical representatives to confer and recommend uniform methods and tables for expressing internationally naval vital statistics.

RESOLUTIONS PROPOSED BY SECTION IX.

I. The congress desires that in every country the statistics of births, deaths, marriages, and divorces may be published periodically and, if practicable, annually.

II. 1. The congress believes that countries, states, or large cities which publish demographic statistics need registrars or similar officers sufficiently trained in medicine and demography and able properly to interpret demographic statistics, especially those of the causes of death.

2. The congress believes that provision for the training and opportunity for the appointment and retention of such men are of fundamental importance in public-health work.

III. 1. The congress desires that family statistics, including those of children born and children living, be gathered periodically in connection with the census.

2. The congress desires that, in connection with the registration of births, information be gathered showing the order of this birth in the family.

3. The congress desires that, in connection with the registration of deaths of married, widowed, or divorced persons, information be gathered regarding the children, if any, of the decedent.

IV. 1. The congress desires that, in every country, criminal statistics may be published periodically and, if possible, annually.

2. The congress desires that a commission be appointed to report upon the subject of uniformity in criminal statistics, especially a uniform nomenclature.

3. The congress desires that the International Statistical Institute, at its meeting in Vienna in 1913, be invited to cooperate in the examination of this subject.

V. The congress urges the demographers of the several countries to pay special attention to the influence of occupation upon mortality.

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The resolutions of Section IX were adopted by the congress.

Prof. Rubner reported that the Permanent International Commission had not selected a place of meeting for the Sixteenth Congress. The cities of Rio de Janeiro (Brazil), St. Petersburg (Russia), and San Francisco (United States) had been considered. It was the tentative opinion of the commission that it would be unwise to hold two successive congresses in the New World, and the commission suggested that the decision as to the place of meeting of the Sixteenth Congress should be left to the Permanent International Commission.

President Walcott put the question on the adoption of the report of the Permanent International Commission. The report was adopted.

The roll of participating countries was called in alphabetical order according to English spelling, the representatives of the several countries responding as follows:

For Argentina: ——— ———[1]

For Austria: PROF. ARTUR SCHATTENFROH.[1]

For Hungary: PROF. FRANCIS TANGL.

MR. PRESIDENT, LADIES AND GENTLEMEN: I have the honor, in the name of the Royal Hungarian Government, to express the sincere gratitude for the cordial hospitality we have enjoyed this week.

The excellent success of this gathering realized all our hopes and expectations. Our thanks for this are due above all to the generous and untiring efforts of the Secretary General and the Executive Committee.

We leave you and this beautiful place—the pearl of American cities—with a sense of regret, but with abundance of splendid memories.

Allow me to bid you farewell in the ingenious words of the famous C. T. Salomensen, the Danish delegate to the last International Medical Congress at Budapest: "Merci! Adieu! Au revoir!"

For Belgium: M. LE DR. MELIS.

Il m'est agréable de dire combien le XV[e] Congrès d'Hygiène et de Démographie, qui se termine aujourd'hui, a brillé par l'affluence des

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médecins les plus savants du monde entier, par la nature des questions qui ont été traitées et l'importance des discussions qui ont fait suite.

Nous devons de la reconnaissance au Gouvernement des Etats-Unis d'Amérique pour l'assistance qu'il nous a donnée en cette circonstance.

Nous devons des remerciments à tous nos confrères américains qui se sont dévoués à la réussite de cette réunion internationale. Je citerai spécialement le Secrétaire-Général, M. le Dr. Fulton, dont le dévouement a été inlassable.

Je ne veux pas terminer sans envoyer un mot de reconnaissance aux habitants de cette belle capitale, qui tous ont rivalisé d'amabilité pour nous rendre agréable le temps qui n'était pas consacré aux séances.

Il est bon de constater que des réunions comme celle qui vient de finir créent entre les médecins du monde entier une sympathie, une union, qui produisent leurs effets dans tous les domaines.

For Bolivia: Dr. Nestor Morales Villason.

Señoras, Señores: La humanidad se debatía dolorosamente encerrada en un círculo de muerte.

Las enfermedades epidémicas como el cólera, las fiebres, destruyan poblaciones enteras, sembrando la desolación y el luto donde posaban su planta, que cual el simbólico caballo de Atila no dejaba crecer la hierba allí donde una vez había tocado. Es entonces que un sabio, un hombre de excepcional penetración, el Profesor Pasteur, anunció que los terribles mensajeros de la destrucción habían podido ser vistos al través del lente del microscopio, por conseguiente que desde aquel momento dejalan de constituir fantásticas entidades para entrar en el dominio real.

Pronto, á la voz del fundador de la teoría bacteriana, nacieron en todos los ámbitos del mundo millares de apóstoles de la nueva doctrina, que desagrando la muerte comenzaron á recorrer tan pronto las calcinadas arenas del África misteriosa, como los manglares de la India y las pantanovas regiones de la joven América, buscando en todas partes con la nunca satisfecha ancla de los sabios, el misterio que explicará la enfermedad del sueño, la del vomito negro; ó la del paludismo y la bubónica.

De vez en cuando á la galante invitación de un país, todos esos incausables obreros de la vida, abnegados pontifices de la luz, recojen

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sus útiles de trajabo y corren á un punto determinado del globo para comunicarse sus impresiones y dar á conocer las nuevas armas descubiertas en la lucha constante con el enemigo de siempre, el microbio.

Hoy es lo que a ocurrido. Llamados por la progresista nación americana, los miembros del XV° Congreso Internacional de Higiene y Demografía han dado tregua á sus esfuerzos para trazar nuevos rumbos á la higiene, orientándola en un sentido esencialmente práctico. La voz de los más grandes sabios, sea dejado escuchar, dictando reglas ó proponiendo mejoras que beneficien al obrero, al niño ó la madre.

Delegado de la República de Bolivia en este acto de trascendencia científica universal, me permito agradecer á mis ilustres colegas por las múltiples muestras de consideración que se han servido dispensarme, y al noble pueblo de Washington por la cordial manera como sea dignado recibirme.

For Brazil: Dr. Cassio Barbosa de Rezende.

When my Government received from the Government of the United States of America the honorable invitation to be present at this Congress, it accepted this invitation with the greatest pleasure. In the first place because, in Brazil, the public health has always deserved the most constant and efficient attention of the Government and, therefore, we could not be indifferent to this Congress, whose aim was just to deal with hygiene and demography.

In the second place my Government could not fail to accept the invitation because the Congress ought to be held here, in this rich and beautiful country, to which we are attached by a very long and sincere friendship.

I followed the works of the Congress with the greatest interest and I am sure that their brilliancy went very far beyond the general expectation.

I therefore congratulate the committee of organization of the Congress on its complete success, and profit by the opportunity to salute again, in the name of my Government, the great people of this great Republic.

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For Cuba: Dr. Federico Torralbas.

For Denmark: Surg. in Chief A. C. J. Bornemann.

Mr. President, Ladies and Gentlemen: In the name of the delegation from Denmark I want to express our thanks for the kind reception accorded to us by the committee of the International Congress on Hygiene and Demography and by the citizens of this most beautiful capital of the United States of America.

We have found this Congress, which is now to be closed, to be of very great interest. Many excellent papers have been read and many discussions of importance have taken place. We feel sure that this Congress will contribute in no small measure to the progress of that great work for the benefit of humanity in which we are all interested.

For France: Mons. Emile Kern.[1]

For Germany: Geheimrat Prof. Max Rubner.

The Congress is at an end, the curtain down, the play is over, and we ask, "What next?" The results of the Congress are for the future, not for this moment. The purpose of the moment is to be grateful for the cordial hospitality which we have enjoyed in America. Since we passed Nantucket Light and your Liberty revealed herself to us, we have been under the spell of the New World. And, ever since, you have bestowed your never-resting hospitality. The words that Wyman spoke at the congress in Berlin: "We assure you of a hearty welcome and will spare no pains to make your coming pleasant and your stay agreeable in every respect," are to-day realized in all our expectations.

Notwithstanding all the daily "business" you have found time enough to pour out the cornucopia of your affectionate hospitality. If time is money your loss of time has overflowed us with millions. From day to day our gratitude increases and will soon be higher than the tallest skyscraper in this country.

The welcome extended to us has given a quicker beat to our hearts, which were always warm toward your great Nation; and,

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returned to the Penates of old Europe, our thankful recollections and our thoughts will wander like a dream to this fairyland, to this country of miracles, to this wonderful land, never to be forgotten.

For Great Britain: SIR ARTHUR WHITELEGGE.[1]

For Canada: DR. FREDERICK MONTIZAMBERT.[1]

For Greece: DR. L. L. CAFTANZOGLU.[1]

For Guatemala: DR. JOAQUIN MENDEZ.[1]

For Italy: DR. FRANCISCO TESTI.

SIGNORI: Il Professore Pagliani, rappresentante ufficiale del Governo italiano in questo Congresso Internazionale d'Igiene e Demografia, costretto ad anticipare la sua partenza per impegni personali, mi ha dato il gradito non chè onorifico incarico di rappresentarlo in questa solenne seduta di chiusura.

Ed io compio con piacere l'incarico affidatomi, tanto a nome degli igienisti e dei demografi civili italiani qui convenuti quanto a nome dei rappresentanti della Regia Marina e del Regio Esercito Italiani.

La nazione italiana sarà grata a questa splendida capitale degli Stati Uniti d'America, la quale insieme alla grandiosità ed alla ricchezza dei monumenti, all'incanto della sua pittoresca e lussureggiante posizione topografica ha saputo accoppiare la gentilezza degli abitanti, la suntuosità dell'accoglienza, l'interesse della classe medica e di tutte le classi in genere allo sviluppo di quella scienza, cosi nobile, cosi utile all'umanità e cosi moderna che è l'igiene.

Ringrazio quindi coll' animo gratissimo a nome del Governo italiano e dei miei colleghi tutti questa nobile città e faccio i più lieti auguri per la continua e progressiva prosperità del popolo americano.

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For Japan: Dr. Seiji Tsukamoto.[1]

For Mexico: Dr. Eduardo Licéaga.

Señor Presidente, Señoras y Señores: "Es mejor prevenir las enfermedades que tener la necesidad de curarlas" es un viejo proverbio que, después de siglos, ahora comienze á llevarse á la práctica, realmente desde que el genio de Pasteur abrió un amplio camino en los antes extraviados senderos de la ciencia. Aquí se encuentran reunidos muchos de los que han seguido las huellas de aquel venerable bienhechor de la humanidad; pero no solamente las han seguido sino que día á día enriquecen la ciencia con nuevos discubrimientos.

Este enjambre de trabajadores que agotan su vida en los hospitales, los laboratorios, los gabinetes de física y de historia natural, no abandonan sus queridos hogares sino por venir desde lejanas tierras ó crusados dilatados mares á este gran feria de la inteligencia á fin de cambiar los productos de la inteligencia como en otros tiempos se cambiaban los productos materiales.

A este congreso han venido ahora los hombres de ciencia para ofrecer á los otros hombres, sus hermanos, el resumen de lo que han descubierto, de lo que han inventado.

En nombre de la República Mexicana, os felicito por la inmensa labor que había llevado á cabo en tan corto espacio de tiempo, en esta encantadora ciudad que nos ha recibido con tanta bondad y cortesía. Me complazco en darle las gracias, en nombre de mi patria, lo mismo que á este gran pueblo americano que ha demostrado una vez más el poderoso impulso que ha impreso á la ciencia sanitaria, que ciencia del porvenir tiene por objeto prevenir las enfermedades mas bien que curarlas.

For the Netherlands: Dr. M. W. Pijnappel.

Mr. President and Gentlemen: I beg to join in what the preceding delegates said to thank you for the very good days we had in Washington, and I particularly want to thank the Congress for its wish that a permanent bureau of these congresses should be created at The Hague. I consider it is a great honor that you bestow on my country, and you may be sure that we will do our very best to prove worthy of it.

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For Norway: Prof. Axel Holst.

Mr. President, Ladies and Gentlemen: Leaving this congress, I beg to thank you first for the extensive and fertile knowledge we have received here. In the second place, I have to express thanks for the stimulating and electrifying influence of the company of the physicians of a country where intense work is a national sport.

For Russia: Surg.-Gen. Dr. Simon von Unterberger.

Nous sommes venus à Washington pour enrichir nos connaissances et puiser les forces pour le travail en faveur d'un des plus grands biens du genre humain: la santé.

Les résultats des discussions et le résultat de l'exposition nous a donné une pensée grandiose dans l'intérêt de l'humanité.

Nous sommes extrêmement satisfaits d'être à ce propos à Washington, cette belle et splendide ville, et notre séjour sera inoubliable, grace à la cordialité et l'amabilité de nos amis, les Américains et les Américaines.

For Spain: Dr. Vicente Llorente.[1]

For Sweden: Prof. Alfred Pettersson.

Herr Präsident, meine Damen und Herren: Bei dieser Gelegenheit, wenn wir nach der Beendigung des XV. Internationalen Kongresses für Hygiene und Demographie im Begriff sind uns zu trennen, bin ich froh meinem Drange Gelegenheit geben zu können einen herzlichen Dank dem Präsidenten, dem Organisationskommitté des Kongresses, der Stadt Washington, und der Regierung der Vereinigten Staaten auszusprechen, einen Dank für alles, was wir hier im Kongresse haben hören und sehen können. Die hygienische Forschung hat den Zweck Mittel zu suchen das menschliche Dasein natürlicher und angenehmer zu machen, die menschliche Arbeit zu erleichtern und die Ergebnisse derselben zu vergrössern. Um dies zu erreichen, unterhalten alle civilisierte Völker, Leute und Institute, die ihre Arbeit der Aufgabe widmen, neue Mittel und Methoden zu entdecken um die Schädlichkeiten fern zu halten, welche die Gesund-

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heit und das Leben bedrohen. Dass diese Arbeit nicht aussichtslos ist, sondern mit Erfolg gekrönt wird, wissen wir schon vorher zum Beispiel davon, dass gewisse Berufskrankheiten seltener geworden sind, und dass die Mittellebensdauer grösser geworden ist, aber dieser Kongress hat uns noch manche Beispiele davon gegeben.

Für den Fortschritt dieser Forschung hat der internationale Austausch der errungenen Resultate, der nach grossem Massstabe bei den internationalen Kongressen stattfindet, grosse Bedeutung. Von Seiten des Landes, welches ich die Ehre gehabt habe hier zu vertreten, sage ich einen herzlichen Dank für den Kongress und für die Arbeit, die hier in der neuen Welt im Lande der grossen Möglichkeiten für das Wohl der Menschheit geleistet worden ist.

For Uruguay: Señor Dr. Maria de Pena.[1]

For Venezuela: Dr. David Lobo.

Mr. President, Honorable Delegates, Ladies and Gentlemen: Before parting, after this closing meeting of the Fifteenth International Congress on Hygiene and Demography, I take pleasure in delivering to you the warm salutation of the Government of Venezuela, whose official representative I am here, as well as my own personal feelings of obligation for the hospitality tendered to me and my clear appreciation of the work achieved by this assembly of noted scientists and promoters of human welfare.

The work of the congress is undoubtedly one of far-reaching protection of the health and life of man, and of moralizing influence, and I sincerely believe that if the general principle set out by it and the important findings of the proceedings are generously and unreservedly carried out the world at large will have to recognize once more that it is not in the deeds of conquest and territorial expansion where international amity and prosperity are to be sought, but in the persevering, upright, and essentially humane endeavor to educate the people in the redeeming principles of soul and body purity, to struggle for the final victory of hygiene, and to promote human happiness and longevity throughout the universe.

As to Venezuela, gentlemen, I have only to repeat what I said at the first plenary meeting of this congress, namely, that none of the

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duties devolved upon communities by modern civilization is ignored, nor any of the various civil and social measures omitted to stamp out epidemic diseases and make the country prosperous internally as well as hygienically; safe for natives from other zones and communities.

This Fifteenth Congress on Hygiene and Demography is entitled to our gratitude for its action toward preparing a vast plan of international sanitation and we must sincerely hope that its advices and scientific methods of dealing with epidemics and endemics will, in the near future, be a source of health, long life, and real welfare for humanity.

At the conclusion of the roll call the president of the congress expressed his gratification in the remarks of the official delegates and his regret at their leave-taking. In his own name, and on behalf of the committee on organization, he thanked, in turn, the officials of the Federal Government, the representatives of the several States, cities, and institutions of the United States, the patrons and contributors, the local committees of the District of Columbia, the authorities of the National Museum, the authorities of the Bureau of American Republics, the Daughters of the American Revolution, the Society of the Red Cross, the representatives of the public press, and others for their several contributions to the congress undertaking. Repeating his regret at the conclusion of the Fifteenth Congress, and expressing his best wishes for the future of the congress and the congressists, President Walcott declared the Fifteenth International Congress on Hygiene and Demography adjourned sine die.

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REPORT OF THE SECRETARY GENERAL.

The history of the Fifteenth International Congress on Hygiene and Demography properly begins at the thirteenth congress (called the eleventh), held at Brussels September 2–8, 1903, when a provisional invitation extended by the delegates of the United States was favorably received. On that occasion Dr. Charles F. Harrington, then secretary of the State Board of Health of Massachusetts, was spokesman for the American delegates. The circumstances leading to the invitation are detailed in the following letter of Dr. Harrington to the late Hon. John Hay, Secretary of State:

HARVARD MEDICAL SCHOOL,
LABORATORY FOR HYGIENE,
Boston, November 7, 1903.

SIR: As one of the delegates from the Government of the United States to the Eleventh International Congress of Hygiene and Demography, held at Brussels September 2–8, I have the honor to submit the following concerning the steps taken to make possible the holding of the thirteenth meeting in this country, the twelfth having already been voted to Germany.

On the first day of the congress a number of the British delegates inquired of me why this country had never shown sufficient interest in public-health matters to extend an invitation to hold a congress at Washington or elsewhere within the United States. In answer to a question as to the probability of a large attendance of delegates from European countries, I was assured that not alone among the British, but among the Germans, Italians, and others, there was a strong desire to meet in this country and that the attendance would be large.

In order to learn what steps were necessary to secure a meeting I called at once upon Prof. Putzeys, the secretary general of the congress, from whom I learned that the next meeting place had been decided upon; that it would be well to bring the matter in hand to the attention of the permanent international committee at its meeting on the closing day of the session; that it would be necessary to submit at least a provisional invitation from the Government, and that I had been elected a member of the committee and would, therefore, be in a position to promote such an undertaking before that body.

Immediately following this interview a conference of the United States delegates, Drs. McCaw, Eager, Evans, Wilcox, and myself, was held; and after some discussion it was unanimously decided that it was most desirable to take immediate action. Thereupon, the delegation called at the office of the United States minister, where an interview was had with Mr. Winthrop, who consented to communicate with the Department of State and ask that the necessary authority be given to extend a provisional invitation to hold the thirteenth meeting at Washington in 1909.

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On the following day I received a note from Mr. Winthrop saying that a provisional invitation, subject to future legislation to make it effective, had been sanctioned. In consequence, on the closing day of the congress, at the meeting of the permanent international committee, I extended the invitation and proposed that such action should be taken as would give to a formal invitation, when extended, precedence over all others which might be received. My communication was received with marked evidence of approval, and the chairman, Prof. Bronardel, stated that, while no vote could be taken which could have binding force on those who attend the next meeting, he was very sure that at the proper time a formal invitation would be accepted with practical unanimity.

After the meeting Prof. Bronardel advised that steps be taken as soon as possible to interest the proper authorities, and requested me to notify him whenever anything definite shall have been determined.

Concerning the great value of these congresses and the eminent desirability of an invitation from this Government there can be, in the minds of all sanitarians, no room for doubt.

I would add that Sir Patrick Manson, the leading authority on tropical diseases and colonial hygiene, suggested that I bring the matter to the notice of our Government—the advisability of an international conference concerning the possibility and prevention of the spread of yellow fever to our own possessions and those of Great Britain and other countries in the Pacific Ocean through vessels infected during passage through the Panama Canal when that waterway shall have been completed.

In conclusion I would respectfully suggest reference of the matters herein contained to the Surgeon General of the Public Health and Marine-Hospital Service for his views thereon.

Respectfully, CHARLES HARRINGTON.

Department of State, Washington, D. C.

In consequence of this letter of Dr. Harrington the Department of State, under date of January 27, 1904, transmitted to Congress a request that authority might be given to the Government of the United States to extend to the fourteenth congress, to be held in Berlin in 1906, a formal invitation to hold the next succeeding congress in the United States. This recommendation of the Department of State was supported by the Department of the Treasury on the advice of the late Surg. Gen. Walter Wyman, of the United States Public Health Service.

No action was taken by the Congress of the United States in 1904. The Berlin congress was postponed from 1906 to 1907. On February 16, 1907, the memorial of January 27, 1904, was again brought to the attention of Congress by the Department of State (H. Rept. No. 8020, vol. 2), and on February 26 the following resolution of the Senate and House of Representatives was approved by President Roosevelt:

Resolved, by the Senate and House of Representatives of the United States of America in Congress assembled, That the President of the United States be, and he is hereby, authorized and requested to extend an invitation to the Twelfth International Congress on Hygiene and Demography, held in Berlin

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in nineteen hundred and seven, to hold its thirteenth congress in the city of Washington, District of Columbia, anno Domini, nineteen hundred and nine, or nineteen hundred and ten.

On July 8, 1907, the Department of State addressed the following letter to the delegates of the United States to the Fourteenth International Congress on Hygiene and Demography, about to be held in Berlin:

DEPARTMENT OF STATE,
Washington, July 8, 1907.

Dr. WALTER WYMAN, *Surgeon General of the Public Health and Marine-Hospital Service;* Maj. WALTER D. MCCAW, *U. S. Army;* Medical Insp. HENRY G. BEYER, *U. S. Navy;* Dr. WILLIAM A. WHITE, *Superintendent of the Government Hospital for the Insane;* Prof. CHARLES HARRINGTON; Dr. ELMER E. HEG; Dr. MAZYCK P. RAVENEL;

Delegates on the Part of the United States to the International Congress on Hygiene and Demography.

GENTLEMEN: In pursuance of the joint resolution of Congress, approved February 26, 1907, a copy of which is herewith inclosed, you are instructed to extend to the International Congress on Hygiene and Demography (which is to meet in Berlin in September next) an invitation to hold the next congress in the city of Washington, in 1909 or 1910, as may be most convenient to the congress.

In extending the invitation you will state the pleasure with which the Government of the United States will learn of its acceptance.

I am, gentlemen, your obedient servant,

(Signed) ROBERT BACON,
Acting Secretary.

On September 23, 1907, the invitation was orally delivered at the opening session of the Fourteenth International Congress on Hygiene and Demography by Dr. Charles Harrington, of Boston, official spokesman for the American delegation. On September 28 the Permanent International Commission decided to recommend the acceptance of the invitation, and on September 29 the invitation of the Government of the United States was formally accepted, at the closing session of the Fourteenth International Congress on Hygiene and Demography, and the acceptance was acknowledged by the Surgeon General of the United States Public Health and Marine Hospital Service, Dr. Walter Wyman.

At the same meeting the following representatives of the United States were made members of the Permanent International Commission: Prof. Charles Harrington, of Boston; Lieut. Col. Walter D. McCaw, of Washington; Prof. William H. Welch, of Baltimore.

Dr. Harrington died in September, 1908. The vacancy thus occurring in the Permanent International Commission was filled by the election of Hon. S. N. D. North, then Director of the United States Census Bureau.

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On November 20, 1908, Hon. S. N. D. North transmitted to the Department of State a memorandum concerning the Fifteenth International Congress on Hygiene and Demography, including an estimate, prepared by Lieut. Col. Walter D. McCaw, of the cost of the congress,[1] and a request that certain representative citizens should be invited to a meeting, to be held in the Department of State, for the purposes of preliminary organization of the forthcoming congress.

On March 2, 1909, Congress passed the diplomatic and consular bill, including an appropriation of $10,000 to meet the actual and necessary expenses incurred by reason of "the invitation and meeting" of the Fifteenth International Congress on Hygiene and Demography at Washington, "in pursuance of the invitation extended by the President of the United States, in virtue of the joint resolution of the Congress thereof."

On April 6, 1909, a meeting, such as was proposed in the letter of November 20, 1908, was held in the diplomatic room, Department of State.

There were present Hon. Huntington Wilson, Assistant Secretary of State; Hon. S. N. D. North, Lieut. Col. Walter D. McCaw, Dr. William H. Welch; Medical Insp. Henry G. Beyer, United States Navy; Dr. John S. Billings, of New York; Dr. A. D. Melvin, Director of the Bureau of Animal Industry; Surg. Gen. George M. Sternberg, United States Army (retired); Dr. George H. Simmons, of Chicago; and Dr. John S. Fulton, of Baltimore. Mr. Huntington Wilson consented to serve as chairman of the committee on organization, with the understanding that the details should be handled by Mr. William Phillips, Third Assistant Secretary of State.

At this meeting a president of the congress was chosen, a secretary general, an executive committee, and three additional members of the committee on organization, subject to the approval of the Secretary of State. All the nominations were approved by the Secretary of State.

On May 16, 1909, the Department of State addressed a letter to the embassies and legations of the United States, confirming the general invitation extended at Berlin by a special invitation to each country. Following is the text of the Department's letter:

In pursuance of a joint resolution of the Congress of the United States, approved February 26, 1907 (the text of which is hereto appended), the delegates on the part of the United States to the International Congress on Hygiene and Demography, held at Berlin in 1907, were instructed to extend to the congress an invitation to hold its next meeting at the city of Washington. The invitation was accepted and the Fifteenth International Congress will hold its sessions at Washington from September 26 to October 1, 1910.

[1] This estimate contemplated a congress to be held in 1910, which should include an exhibition, and would cost approximately $100,000.

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The Department of State has assumed the responsibility of the conduct of the congress, and has made the following appointments for the purposes of its organization:

President: Dr. Henry P. Walcott, of Massachusetts.
Secretary General: Dr. John S. Fulton, of Maryland.

Members of the General Committee.

Prof. William H. Welch, of Maryland.
Dr. John S. Billings, of New York.
Prof. Victor C. Vaughan, of Michigan.
Mr. Edward T. Devine, of New York.
Dr. Abraham Jacobi, of New York.
Dr. A. C. Abbott, of Pennsylvania.
Prof. F. F. Wesbrook, of Minnesota.
Dr. S. N. D. North, of Washington.
Surg. Gen. George M. Sternberg, of Washington.
Col. Walter D. McCaw, of Washington.
Medical Insp. Henry G. Beyer, of Washington.
Dr. A. D. Melvin, of Washington.
Surg. Gen. Walter Wyman, of Washington.
Mr. John M. Glenn, of New York.
Dr. Hermann M. Biggs, of New York.
Prof. Theobald Smith, of Massachusetts.
Dr. Charles D. Walcott, of Washington.
Dr. George H. Simmons, of Illinois.

The International Congress on Hygiene and Demography ranks among the most important of international scientific gatherings. It comprises distinguished representatives of many and diverse professions which are more or less connected with governmental administration, and it is therefore thought that representation at the congress by official delegates would not be without advantage to the Government to which you are accredited.

You are therefore instructed to extend to that Government an official invitation from the Government of the United States to participate in the Fifteenth International Congress on Hygiene and Demography, to be held at Washington, September 26 to October 1, 1910. In extending the invitation you will explain that it is meant to include also the important State, provincial, and municipal governments, and you will express the pleasure with which the Government of the United States will learn of its acceptance.

The second meeting of the committee on organization was held in Washington on May 25, 1909, when the presidents of the sections were chosen, ten in number. The committee recommended that the secretary general should be sent to Europe in the interests of the forthcoming congress. Some additional nominations were made for membership in the committee on organization. All the recommendations of the committee were approved by the Department of State. New members were added to the committee on organization from time to time until the total number reached 91.

Through the courtesy of Dr. S. N. D. North, then Director of the Census, quarters were provided for the secretary general and his assistant in the Division of Vital Statistics of the Census Bureau. This comfortable arrangement continued for more than a year.

At this time there was no legislation authorizing the President to invite the State governments to take part in the congress, and it was not possible to secure such legislation within the year. The Department of State, however, agreed to communicate with the governors of

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the States, announcing the arrangements so far made and bespeaking the interest of State governments in the representations subsequently to be made by the committee on organization. The Department's letters to the governors were sent out under date of July 7, 1909, and the congress bureau, under date of August 2, 1909, addressed letters of invitation to the State governments.

Copy was prepared for a preliminary announcement of the congress in French, German, and English. Correspondence was prepared to be addressed to all State and local boards of health, registrars of vital statistics, and other official agencies dealing with questions of public health. The Department of State was requested to write a letter to the other Federal departments asking that the undertaking be made known to all the bureaus having relations to public health and vital statistics and asking their cooperation.

The Department of State authorized the secretary general to visit London, Paris, Brussels, The Hague, Berlin, Vienna, Budapest, and Rome in the interests of the coming international congress. On July 22, 1909, the secretary general sailed on this mission, visiting the eight European capitals in order mentioned above, and returning to New York on September 29. During his absence the correspondence with the various States was executed and sent out.

In the meantime Mr. William Phillips, Third Assistant Secretary of State, was transferred to the embassy of the United States in London, and his duties in relation to the Congress on Hygiene devolved on his successor, Mr. Eugene Hale.

On November 5, 1909, at the third meeting of the committee on organization, the question of postponement of the Congress came up. It was learned that some of those chosen as presidents of sections had been out of the country for several months, and their notifications of election had been delayed or insufficiently considered. Most of them felt that the time was far too short for the preparation of a creditable program. It was also felt that the prospect of spirited participation by the States was not good, for the reason that the Federal Government was not in a position to invite the States, and the necessary legislation could not possibly be enacted within three months. The suggestion of postponement was well received by the Department of State.

At this meeting the secretary general reported upon the sources of funds and the cost of several previous international congresses, and presented an estimate of $65.000 as the probable cost of the Fifteenth International Congress on Hygiene and Demography, assuming that the congress would occur in September, 1910, and that there would be no exhibition. The committee did not favor a project thus limited, and voted to request the Department of State to include in the

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departmental estimates for the coming year a sum of $50,000 for the expenses of the Congress on Hygiene and Demography. The committee was informed that the department would not recommend an additional appropriation exceeding $25,000. Prof. Walter F. Willcox, Prof. Victor C. Vaughan, and the secretary general were appointed a committee to prepare another estimate to be transmitted to the Department of State for use in the preparation of the departmental estimates and for transmission to Congress. This estimate was transmitted to the Department of State three days later. The probable cost was estimated at $94,000. This document was not, however, sent by the Department to Congress.

The secretary general was instructed to inform the foreign members of the Permanent International Commission and other interested persons that the American committee was considering the advisability of postponement, and desired to give notice in order to allow ample time for consideration. On December 10, 1909, the Department of State formally approved the postponement, and the American members of the Permanent International Commission were authorized to submit the proposal to the commission.

On January 5, 1910, Mr. Lodge introduced in the Senate a joint resolution authorizing the President of the United States to invite the several States to take part in the congress, and a joint resolution authorizing the postponement of the congress. On January 7, 1910, Mr. James R. Mann introduced similar joint resolutions in the House of Representatives. These resolutions were promptly passed. Their text follows:

[PUBLIC RESOLUTION—No. 12.]

S. J. Res. 56.—Joint resolution authorizing the President of the United States to invite the States to participate in the Fifteenth International Congress on Hygiene and Demography.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the President of the United States be, and he is hereby, authorized and requested to extend an invitation to the governor of each State to appoint a State committee of no more than five members to cooperate with the committee on organization in planning and preparing the exhibition of the Fifteenth International Congress on Hygiene and Demography.

Approved, January 24, 1910.

[PUBLIC RESOLUTION—No. 13.]

S. J. Res. 55.—Joint resolution authorizing the postponement of the Fifteenth International Congress on Hygiene and Demography.

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the invitation extended by the President of the United States to the Fourteenth International Congress on Hygiene and

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Demography, in accordance with the provisions of a joint resolution entitled a "Joint resolution authorizing the President to extend an invitation to the Twelfth International Congress on Hygiene and Demography to hold its thirteenth congress in the city of Washington," approved February twenty-sixth, nineteen hundred and seven, shall be modified and amended so that it shall provide for the holding of the Fifteenth International Congress on Hygiene and Demography at some place in the United States, to be selected by the President, in the year nineteen hundred and eleven or nineteen hundred and twelve.

Approved, February 3, 1910.

On February 5, 1910, a formal letter to Prof. Rubner, president of the Permanent International Commission, was sent by Dr. Welch, Dr. North, and Lieut. Col. McCaw. Under the date of February 10 the Department of State prepared the diplomatic correspondence concerning postponement.

Letters were sent to all the foreign members of the Permanent International Commission, announcing the passage of an act of Congress authorizing the postponement of the congress, and asking them to choose between the years 1911 and 1912.

During February a number of letters were received from members of the Permanent International Commission expressing a preference for 1912 as the congress year. Unofficial letters were sent to all the members of the Permanent International Commission saying that the congress would probably come off in September, 1912, and asking them to spread the information in their neighborhood in order that conflict of dates might be avoided. This information was also distributed to the members of the committee, and an expression of opinion desired on the question of the new date.

In April the conference of State and provincial boards of health passed a resolution approving the act of Congress authorizing the President to invite the several States, and urging the committee on organization to take whatever steps were necessary to secure the issue of this invitation to the several States by the Department of State at the earliest possible moment.

The invitations to the States were not sent out, on the ground that the new date should be announced before that was done.

On May 4, 1910, the fifth meeting of the committee on organization occurred, and on this date the committee on organization recommended that the week beginning September 23, 1912, should be chosen as the new date.

In June, 1910, through the courtesy of Lieut. Col. McCaw, the headquarters of the Congress were transferred from the Bureau of the Census to the Army Medical Museum.

On June 18, 1910, the secretary general called on Mr. Hale to learn whether several members of the executive committee would be received

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at the Department of State on some day in the week following for the purpose of discussing the affairs of the International Congress on Hygiene and Demography. On June 27 this projected interview occurred, Mr. Hale representing the Department of State, and Dr. Welch, Dr. Beyer, Col. McCaw, Prof. Willcox, and the secretary general representing the committee on organization. At the end of this interview the committee understood it to be agreed that at the forthcoming session of Congress the Department of State would ask for an appropriation, in the urgent deficiency bill, of $10,000 to cover the preliminary work in the year ending June 30, 1911, a like appropriation to be applied to preliminary work in the year ending June 30, 1912, and an appropriation of $30,000 on account of the congress itself.

With this understanding, the committee on organization was encouraged to seek private subscriptions, and believed that an additional sum of $50,000 might be obtained in this way.

Congress adjourned without having considered any additional appropriation for the International Congress on Hygiene and Demography, but the unexpended balance of $10,000 appropriated in the diplomatic and consular act for the fiscal year ending June 30, 1910, was made available for the following year. This balance amounted to $2,300.

During the summer of 1910 the President of the United States consented to be honorary president of the Fifteenth Congress, and selected the city of Washington as the place of meeting. The Department of State approved the date, September 23 to 28, in the year 1912, as the time of meeting. The committee on organization renewed its request to the Department of State to extend to the several States the invitation authorized by the act of Congress approved January 24, 1910. The American Public Health Association, at its meeting in Milwaukee in September, created a committee for the purpose of promoting the interests of the International Congress on Hygiene and Demography, and to secure, if possible, the participation of the United States in the International Hygiene Exhibition to be held in Dresden in 1911.

The departmental estimates sent in by the Department of State to Congress on its opening in December included an item of $10,000 for preliminary work in connection with the International Congress on Hygiene and Demography. In the urgent deficiency bill no proposition concerning the congress was found. A good many members of the committee were called on during the session to assist in securing the appropriation asked. There was some discussion about having a supplementary item of $10,000 introduced into the urgent deficiency bill. It was thought unwise to make any proposition in

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Congress on the committee's own account, and we were advised by Senators and Representatives that a proposition of that sort, unless originating with the Department of State, would have no chance to pass, and might imperil the appropriation already included in the estimates. The executive committee authorized the secretary general to request the Department of State to send a supplementary item to Congress asking for $10,000 in the general deficiency bill. The department declined to send such a supplementary item, on the ground that it was too late.

In January, 1911, the Postmaster General granted to the International Congress on Hygiene and Demography the franking privilege. This concession was secured through the recommendation of the Department of State, in consequence of the request of Prof. Walter F. Willcox, vice chairman of the executive committee and president of Section IX.

Under date of February 4, 1911, the Department of State sent to the governors of the several States the invitation authorized by the joint resolution of Congress, approved January 24, 1910.

The bureau followed up this invitation by active correspondence in all parts of the country.

On March 3, 1911, the diplomatic and consular bill passed, carrying the appropriation of $10,000 for the fiscal year ending June 30, 1912.

On March 4 the executive committee held its eighth meeting, and took steps to secure the services of a director of the exhibition, and to appoint a treasurer and a finance committee; and authorized the secretary general to make application to the Russell Sage Foundation for an appropriation. The Russell Sage Foundation granted a sum of $5,000 for the purposes of the International Congress. Mr. Charles J. Bell, president of the American Security & Trust Co., agreed to serve as treasurer. The United States Bureau of Public Health, through Surg. Gen. Wyman, detailed Dr. Joseph W. Schereschewsky to temporary service as director of the exhibition. Dr. Schereschewsky began his duties as director of the exhibition.

Negotiations were begun with the American Red Cross for the joint ownership and use of a temporary building for exhibition purposes. These arrangements were consummated and approved at the meeting of the executive committee on October 7, 1911.

During the summer the secretary general visited the States of Missouri, Kansas, Colorado, California, Oregon, Idaho, Wyoming, Nebraska, and Iowa, interviewing the governors, the State boards of health, and other government bureaus, and the boards of the important cities along the route, for the purpose of securing the cooperation of the States and cities, the acceptance of the President's invi-

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tation, and the appointment of the committees authorized by the act of Congress. He attended a number of medical and public health gatherings, including the American Medical Association, the National Association for the Study and Prevention of Tuberculosis, and the Conference of State and Provincial Boards of Health.

Early in the autumn of 1911 the increasing space requirements of the Army Medical Museum and Surgeon General's Library, together with the expanding needs of the executive bureau of the International Congress, necessitated a search for new quarters. Through the kind offices of Senator W. Murray Crane the third floor of the Senate Annex was placed at the disposal of the management of the Congress, and all of the subsequent work, including the publication of the Transactions, was done in this building.

On October 13, 1911, Mr. Hale informed the secretary general that the departmental estimates were in preparation, and that the appropriations for the international congress were included. On November 4 this information was conveyed by the secretary general to the executive committee and to the committee on organization, meeting in New York.

About December 4, 1911, Mr. Smith discovered that the Book of Estimates, but recently transmitted to Congress, did not contain the expected appropriation for the International Congress on Hygiene and Demography. This information was brought to the attention of Mr. Hale by Mr. Crane, United States Senator from Massachusetts, on December 8, and the Department of State, under date of December 13, addressed a letter to the Secretary of the Treasury requesting an additional appropriation of $40,000 on account of the International Congress on Hygiene and Demography.

On January 4, 1912, a letter of the Secretary of the Treasury transmitting the Department of State's request for an additional appropriation was received in the House of Representatives and referred to the Committee on Foreign Affairs. This letter became Public Document No. 403 of the Sixty-second Congress, second session. The more important parts of the document are reprinted here, including the memoranda transmitted to the Department on November 8, 1909, and subsequently.

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LETTER

FROM

THE SECRETARY OF THE TREASURY

TRANSMITTING

COPY OF A COMMUNICATION FROM THE SECRETARY OF STATE SUBMITTING AN ESTIMATE FOR AN APPROPRIATION TO ENABLE THE GOVERNMENT OF THE UNITED STATES TO SUITABLY PARTICIPATE IN THE FIFTEENTH INTERNATIONAL CONGRESS OF HYGIENE AND DEMOGRAPHY, TO BE HELD IN WASHINGTON, D. C., IN 1912.

JANUARY 8, 1912.—Referred to the Committee on Foreign Affairs and ordered to be printed.

TREASURY DEPARTMENT,
OFFICE OF THE SECRETARY,
Washington, January 4, 1912.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith, for the consideration of Congress, a communication from the Secretary of State, of December 13, 1911, submitting an estimate of appropriation in the sum of $40,000, to enable the Government of the United States suitably to participate in the Fifteenth International Congress of Hygiene and Demography which is to be held at the city of Washington, D. C., in 1912, in pursuance of the invitation extended by the President of the United States in virtue of the joint resolution of the Congress thereof, approved February 26, 1907, and to meet the expenses that will actually and necessarily be incurred by the United States by reason of such invitation and meeting.

The necessity for the submission of this item and the reasons for its omission from the regular annual estimates for 1913 are set forth in the communication of the Secretary of State.

Respectfully, (Signed) FRANKLIN MACVEAGH,
Secretary.

DEPARTMENT OF STATE,
Washington, December 13, 1911.

The SECRETARY OF THE TREASURY.

SIR: I have the honor to request that you will submit to the Speaker of the House of Representatives, to the end that the appropriation therein requested may be granted, the following item:

To enable the Government of the United States suitably to participate in the Fifteenth International Congress of Hygiene and Demography which is to be held at the city of Washington, D. C., in 1912, in pursuance of the invitation extended by the President of the United States in virtue of the joint resolution of the Congress thereof, approved February 26, 1907, and to meet the expenses that will actually and necessarily be incurred by the United States by reason of such invitation and meeting, $40,000.

This item was not included in the annual estimates for foreign intercourse for the fiscal year ending June 30, 1913, for the reason that the necessary data required from the management of the international congress in support of the item were not furnished to the Department of State until after the estimates had been submitted to the Speaker of the House of Representatives. As the

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international congress will be held in September, 1912, consideration of the item by Congress at its present session is necessary.

As stated in the item, this International Congress on Hygiene and Demography will meet at the city of Washington by reason of action taken by the Congress of the United States, and the President of the United States in pursuance thereof.

For the purposes stated in the item, my predecessor, Mr. Root, in the estimates for foreign intercourse for the fiscal year ending June 30, 1910, requested an appropriation of $50,000. This amount was, however, in the act making appropriations for the Diplomatic and Consular Service for the fiscal year ending June 30, 1910, cut down to $10,000.

The committee on organization of this International Congress on Hygiene and Demography was at once organized. It having been found by this committee that it was not possible to make suitable preparation for the meeting of the congress in 1910, the meeting was postponed until the year 1912, and the Congress of the United States, in the diplomatic and consular appropriation act for the fiscal year ending June 30, 1912, appropriated an additional $10,000 "for the continuance of the preliminary work necessary in preparing for the meeting in the United States in the year 1912 of the Fifteenth International Congress on Hygiene and Demography in pursuance of the invitation extended by the President of the United States in virtue of the joint resolution of the Congress thereof, approved February 26, 1907," making a total appropriation of $20,000 out of the $50,000 estimated by my predecessor as required to meet the obligations and responsibilities of this Government under the invitation.

It is this department's understanding that the $20,000 already appropriated was intended for the preliminary work and, as stated in the diplomatic and consular act for the fiscal year ending June 30, 1912, "the continuance of the preliminary work necessary in preparing for the meeting." In any event, as the congress is recognized abroad, and is, in fact, an official congress authorized by the Congress of the United States, suitable provision should be made by the Congress of the United States for the conduct of the Washington meeting of the congress in a manner to compare as favorably as possible with the conduct of the meetings of the congress held at the capitals of other Governments. It is thought that the appropriation of $40,000 now requested, together with the amount which will be derived from personal contributions, will suffice for the purpose.

For information of Congress I beg to inclose herewith memoranda prepared by the organization committee of the international congress in support of the item.

I have the honor to be, sir, your obedient servant,

(Signed) P. C. KNOX.

IMPORTANCE OF THE FIFTEENTH INTERNATIONAL CONGRESS ON HYGIENE AND DEMOGRAPHY.

The Fifteenth International Congress on Hygiene and Demography will meet in the United States in response to an invitation extended by the President, in pursuance of an act of Congress approved February 26, 1907. The invitation was presented by the American delegates to the Fourteenth International Congress on Hygiene and Demography, meeting in Berlin in September, 1907, and was accepted.

In April, 1909, the Department of State created a committee of organization, and in May, 1909, appointed a president of the congress, presidents of the nine sections of the congress, and a secretary general.

Under date of May 10 the Department of State addressed invitations, through the American ministers and ambassadors, to all foreign Governments announcing September 26, 1910, as the opening date. Later it was found impossible to make adequate preparations in so short a time, and Congress authorized post-

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ponement until 1911 or 1912. (Public Res. 13, approved Feb. 3, 1910.) In April, 1910, the Department of State sent out circulars announcing the change of date, and subsequently the department approved the date Sepember 23–28, 1912, as the time of meeting.

Acceptances of the invitation have been received from 23 countries, including the Dominion of Canada.

Congress has also authorized the President of the United States to extend an invitation to the several States of the United States. (Public Res. 12, approved Jan. 24, 1910.) The Department of State sent out this invitation under date of February 4, 1911. Twenty-nine States have accepted this invitation.

International Congresses on Hygiene and Demography are held at intervals of three to five years, and always on the invitation of a national Government. Fourteen such congresses have been held in European capitals. The fifteenth congress, to be held in the United States in 1912, will be the first to meet outside of Europe.

These congresses have done much to promote international confidence and to relieve international commerce of quarantine restrictions and other disabilities due to the fear of transmissible diseases. They have improved the practice of hygiene and demography, especially in the countries where they have been held. The Fifteenth International Congress on Hygiene and Demography, meeting in the United States in September, 1912, will occur at a most propitious time, as the following considerations will show:

(*a*) An opportunity to convince the world of the soundness and stability of the Isthmian Canal undertaking is greatly to be desired, and the forthcoming international congress offers such an opportunity. The conquest of pestilential conditions has been recognized as a sine qua non in the construction of the canal. Its future value as a thoroughfare depends no less on the maintenance of wholesome conditions on the Isthmus in the face of predisposition and exposure to epidemic influences. The forthcoming congress will permit us to make an adequate presentation of our achievements in the Canal Zone, and to convince the world that the canal enterprise is sound and stable. (Note 1.)

In Cuba, Porto Rico, the Philippines, and Hawaii, as well as in the Canal Zone, we have acquired notable mastery of tropical diseases, and our achievements will furnish inspiration and example to coming generations.

We have contributed our full quota to that knowledge which enables civilization to expand into fertile regions heretofore deadly to white men. We have enlarged the inhabitable area of the earth. We have developed a most successful practice of public hygiene, through which subject populations have been vastly benefited. The free population of continental United States, if informed, will demand equal safeguards against preventable sickness and untimely death.

(*b*) The pure-food laws and those governing the inspection of animals and meat products have a far-reaching influence on the country's trade, and have promoted uniformity and efficiency in the enactment and administration of food laws in the States. Such a congress as that to be held in Washington in 1912 will confirm and extend the benefits of food legislation.

(*c*) The need of a systematized public-health organization, properly conformed to our plan of government, is clearly perceived by the people of the United States, is constantly urged by certain voluntary associations, and has been brought to the attention of Congress in presidential messages. Numerous legislative propositions on this subject have been considered in the Congress of the United States.

The development of a public-health organization, such as the country needs, is a major problem in statecraft. Its solution is conditioned on the leadership of the Federal Government, the States concurring. Means of exercising this leadership and securing this concurrence, have been furnished by the act of Congress, approved January 24, 1910, authorizing the President to invite the States to participate in the forthcoming International Congress on Hygiene and Demography, and in the exhibition.

Under the provisions of this act we shall begin at once to inform ourselves concerning the status of public hygiene and demography in all parts of the United States. This information, nowhere available at present, is indispensible alike to the Federal Government and to the State governments, in the presence of a demand for the regular exercise of their joint and several public health powers.

(*d*) The statistics of each leading country have their strong and their weak points. It was in the United States that official labor statistics originated, and from this country they have spread to every other great industrial State. But in the field of health statistics, vital statistics or demography, the United States

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has lagged far behind not merely England, Germany, and France, but even Russia, Greece, Australia, and Uruguay. The present public-health movement in the United States is now demanding that a scientific statistical basis for it be laid by organizing and developing American work in vital statistics.

No doubt this duty rests most heavily upon our States and cities, but they can do little without the cooperation of the Federal Government. That cooperation took on a new and far more effective form when the Census Bureau was made permanent and charged with a duty of cooperating with the States and cities in the development of a national system of vital statistics. Since 1902, when the change was made, the improvement has been greater than during the century preceding. The main difficulties now are two—lack of an effective demand in many States for proper and complete recording of deaths, and lack of officials trained to use and interpret the figures so gathered in such a way as to make them serve the cause of public health.

The Census Bureau is dependent on local governments for information concerning births and deaths. Failure (Note 2) of local governments with respect to registration of births and deaths subjects private interests (Note 3) to inconvenience and loss far exceeding the cost of systematic registration; deprives the Government of the United States of necessary information concerning the growth and health of the people (Note 4); impairs the credit of the country among foreign demographers; and has caused the country to appear as a defaulter (Note 5) for the last 30 years in an express international obligation.

These difficulties should be largely removed by the meeting of the Fifteenth International Congress on Hygiene and Demography in this country.

(*e*) Besides the official interests of the Federal Government and of component and constituent governments, in the forthcoming international congress, one must take into account the many private and unofficial agencies which are concerned with problems of public health. Wealthy citizens have founded institutes for the study and prevention of infectious diseases, and for the study of special problems, such as tuberculosis, the hookworm disease, insanity, the hygiene of infancy and childhood, of schools, and of occupations. Millions are permanently invested in such institutions.

Other large sums are expended annually in the promotion of public health by numerous voluntary associations, supported mainly by membership fees. (Note 6.) The American literature of public hygiene is largely produced by these agencies. Much of this literature is very valuable to special students and experts, and much of it is intended for the general public. That there is an unequivocal demand for information concerning the prevention of disease is shown by the large output of popular articles appearing in magazines and newspapers. In many parts of the country voluntary associations are conducting active campaigns of education by means of lectures, demonstrations, and exhibitions. It may be said in a few years, if not now, that the American citizen is of all men most efficient in self-defense against the common infectious diseases.

For the future of American hygiene and demography these private and unofficial activities are most significant. One sees in them the productive exercise of a free and intelligent public opinion; and in such a possession our country is peculiarly rich.

We have seen that the task of adjusting the practice of public hygiene to the principles of free government will prove a searching test of the intelligence and steadfastness of the American people, but a test which we may meet with confidence. An international assembly of public hygienists may contribute much to the solution of our problem, but chiefly it offers to the Federal, State, and municipal governments of the United States an invaluable opportunity to study their joint and several relations to public health and demography.

In this view of the congress project, the period of preparation is seen as determining the success or failure of the undertaking. The larger profits, over and above the satisfaction of having well discharged an international obligation, will be supplied by the States according to the measure and the spirit of their participation. The Federal Government can do little to enhance the effect of its invitation to other countries, but some emphasis can be added to the formal invitation which is extended to the States. It is not necessary to acquiesce in the regrets or excuses or reluctance of a member of the family. No State must be left in doubt as to the spirit or significance of the invitation. By information, by importunity, by all sincere means, it is necessary to provoke some urgency of desire to participate in the congress. This is the immediate task of the organizing committee, and it should begin at once.

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Having all these important responsibilities in public hygiene and demography, and sharing these responsibilities with her own local governments as well as with other nations, it is evident that the United States has taken a wise and necessary step in inviting the nations and the States to a conference on these subjects. Our hospitable intention toward the nations has given us, for a limited time, the free use of an instrument of power. To develop this power and to apply it at its optimum efficiency throughout our period of control to the needs and purposes of our country is to create out of a passing event a great and stable value.

NOTES.

(1) In 1903, at Brussels, Sir Patrick Manson, the leader of the British delegation, and the foremost authority on tropical diseases, spoke to the American delegation about the possibility of spread of yellow fever to the colonial possessions of Great Britain and other countries by vessels infected while passing the Isthmian Canal. He suggested that the American delegates should bring to the notice of the Government the advisability of holding an international conference when the canal shall have been completed. This suggestion was afterwards renewed by Sir Patrick Manson in a letter to the late Prof. Charles Harrington, of Boston, who was chairman of the American delegation to both the Thirteenth and Fourteenth International Congresses on Hygiene and Demography.

It is also noteworthy that the Liverpool School of Tropical Medicine, some four or five years ago, sent out a special yellow fever commission to study our performance in Cuba and Panama.

(2) The registration area for deaths includes 18 States, and accounts for about half the population of the country. Within this area, however, and especially in the rural portions of registration States, the returns of death are imperfect both in quality and number.

There is no registration area for births. It is therefore impossible to state the infant mortality for any part of the United States according to the practice of other countries. Our infant death rate is based on the mid-year population under 1 year of age. The accepted and far more useful basis is the number of children born during the year.

(3) Numerous rights, duties, privileges, immunities, and disabilities of citizens are conditioned on the age attained, and the prima facie evidence of attained age is regularly supplied in other countries by means of official certificates of birth. Certificates of death have quite as important utility.

Where the main facts concerning birth and death are not officially recorded, the courts are habituated (and apparently insensitive) to delay, expense, and even failure of justice through the defect or absence of this sort of evidence. Amounts of legislation are passed every year, department regulations are made, civil contracts and other instruments, all based on the assumption that official records of this sort are regularly and everywhere available. The absence of such records inflicts a great amount of avoidable expense on many departments of Government and on private interests.

(4) The main emphasis falls here. Public hygiene is as precarious as any other business when governed by conjecture, and the rule of conjecture must prevail wherever information is lacking. A truly efficient public-health service is impossible in the absence of reliable vital statistics.

(5) It is not generally known that the Federal Government has a chronic disability in foreign relations, which has been brought, more than once, to the attention of the Federal Government. In 1893, and again in 1906, the Government of Italy notified the Government of the United States of its failure to comply with the stipulations of a convention, signed in 1872, wherein the United States and Italy agreed, in case of the death of a citizen of either country within the territory of the other, to forward a certified copy of the official record of death. Through neglect of mortality registration by the States, the Federal Government is unable to comply with the terms of this convention. Failures occur regularly, and these failures are not confined to that part of the United States which is outside of the registration area.

(6) One of these voluntary associations, the National Association for the Study and Prevention of Tuberculosis, was largely responsible for the international congress on tuberculosis which met in 1908. This association created the committee of organization, which raised a sum exceeding $100,000 for the purposes of that congress.

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THE SOURCES OF FUNDS AND THE COST OF PRECEDING CONGRESSES.

The sources of funds for European congresses have been public appropriations, membership fees, and private donations. The public appropriations have usually included appropriations by the capital city, and sometimes by other cities. Funds have usually been available two years in advance of the date of meeting, and very active preparations have been made during 18 months or more preceding the date of meeting.

The following congresses cost more than the sums mentioned:

London, 1891, more than $50,000.

Budapest, 1894, more than $60,000.

Madrid, 1898, more than $40,000.

Berlin, 1907, more than $76,000.

The international congress on tuberculosis at Washington in 1908 cost $161,000, of which $100,000 was disbursed by the committee on organization, the remainder by the Department of State.

The international medical congress at Budapest, 1909, cost over $91,000.

The international exhibition of hygiene, opened in April, 1911, in Dresden, will cost 2,095,000 marks ($523,500).

PROBABLE COST OF THE FIFTEENTH INTERNATIONAL CONGRESS ON HYGIENE AND DEMOGRAPHY.

[Segregated under five heads.]

(1) *Personal services.*—The clerical work likely to fall on the executive bureau in the next 12 months may be forecast as follows:

First-class mail, incoming and outgoing	pieces	50,000
Circulars, printed notices, preliminary announcements, outgoing	do	115,000
Express and mail packages, outgoing	do	600
Typewriting (not correspondence)	pages	5,000
Index cards		30,000

This amount of work, if done in a year, would require all the time of 10 clerks and 3 superior officers. Six weeks before the opening date the pay roll will probably include 50 persons, and on the date of opening the number will have risen to 80. Among the short-time employees will be some expensive ones, 18 translators and interpreters, and as many reporters, having good command of three languages.

Personal Services.

Secretary general, 16 months; clerk, 16 months; assistant secretary general, 12 months; 2 clerks, 14 months; 2 clerks, 12 months; 5 clerks, 6 months; 20 additional clerks for registration, information, transportation, etc., 3 weeks; 20 attendants, messengers, watchmen, 5 weeks; 18 translators and interpreters, 1 week; 15 section reporters, 1 week; expenses of the personnel—amounting in all to $27,416.

Postage, Stationery, Office Supplies, Miscellaneous.

Outgoing mail, 25,000 pieces first class, 115,000 third class, 20 per cent foreign; correspondence stationery for bureau, nine sections, and exhibition; registration cards, membership cards, invitations, circulars, miscellaneous printed matter; typewriters, paper, carbon, ribbon, pencils, ink, filing devices and furniture, index cards, etc.; rent, temporary construction and fixtures in bureau; information bureau at Union Station, with guides speaking German, French, and Spanish; decorations, bunting, flowers, music, telephones; rent of furniture, rugs, and fixtures; storage, drayage, express, placards, signs, badges, insurance, press service, other miscellaneous items—amounting in all to $7,370.

Advance Printing.

Preliminary announcements, three or four editions, 75,000 in all, averaging 60 pages, 9 by 11 inches, 10-point type, and printed in three languages; abstracts

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of 180 papers, in three languages; cost of translation and abstracting; programs, about 15,000, in three languages; daily journal during the Congress—costing in all about $13,200.

EXHIBITION, ENTERTAINMENT, MEDALS, AND BADGES.

The committee on organization has in mind a relatively small exhibition, as it must be, to cost within the total estimate under this head, namely, $18,850.

POSTADJOURNMENT: TRANSACTIONS.

Preparation of copy, editing, proof reading, clerical work after adjournment; printing and distributing 4,000 sets of transactions, 3,000 pages per set—$23,000.

PREVIOUSLY EXPENDED.

Out of $20,000 previously appropriated by Congress to be expended under the direction of the Department of State, there has been expended since April, 1909, for salaries of secretary general and assistants; for traveling expenses, including mission of secretary general to Europe; for printing, postage, office supplies, and other miscellaneous items—$15,770.61.

Summary.

(1) Personal services	$27,416.00
(2) Postage and stationery, office supplies, miscellaneous	7,370.00
(3) Advance printing	13,200.00
(4) Exhibition, entertainment, medals, and badges	18,850.00
(5) Postadjournment; transactions	23,000.00
(6) Already expended	15,770.61
	105,606.61

The House of Representatives passed the diplomatic and consular bill, with an item of $10,000 for the purposes of the International Congress on Hygiene and Demography. When the bill reached the Senate the committee on organization was asked to appear before the Subcommittee on Appropriations for the purpose of explaining the supplementary estimate transmitted by the State Department, through the Secretary of the Treasury. Lieut. Col. McCaw, Mr. Durand, and the secretary-general attended for that purpose.

Mr. Curtis, Senator from Kansas, and chairman of the Subcommittee on Appropriations, requested, in addition to the verbal statements and answers made on the part of the committee on organization, a written summary of all the costs likely to be incurred, with a segregation showing what part of the cost would be defrayed by the Government and what part would be defrayed by the committee on organization. Such a statement was prepared, showing that the committee expected to pay all the costs in excess of $60,000, and had already expended a sum which, together with funds in hand or pledged, plus membership fees, would meet a total anticipated cost of $113,000 to the Government and the committee on organization.

On April 4, 1912, the Senate committee reported the diplomatic and consular bill, with the item of $10,000 increased to $40,000.

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The House concurred in the amendment, and the bill became a law early in May, 1912.

Meanwhile the committee on organization had obtained, in cash and pledges, private funds to the amount of $36,575, so that comfortable assurance was felt that the congress and exhibition could be realized as planned. With the exception of the grant made by the Russell Sage Foundation, this amount was raised within the four months preceding the passage of the Diplomatic and Consular Act. In November, 1911, the committee on organization created a subcommittee on finance, Mr. John M. Glenn, Dr. Edward T. Devine, and Dr. Livingston Farrand. This subcommittee met shortly after, in New York, the secretary general being present. It was decided to secure, if possible, the services of Mr. H. Wirt Steele, secretary of the Maryland Association for the Prevention and Relief of Tuberculosis. The Maryland Association readily consented to allow the proposition to be made to Mr. Steele, and, Mr. Steele consenting, the arrangement was made. At the December meeting, the subcommittee on finance made its report, and, on its own request, was discharged.

The committee on organization was now able to appoint an assistant secretary general, a necessity which had been presented in each of the numerous estimates prepared during the preceding two years. Mr. Selskar M. Gunn, associate professor in the Massachusetts Institute of Technology, accepted the position on May 4, and shortly afterwards joined the executive staff in Washington. Up to this time, forty-three of the American States had accepted the Federal Government's invitation, though a very clear understanding of the congress project was lacking in some of the States. Many of the governors had overlooked that part of the official invitation which requested the transmission of the invitation to the municipal governments. Important cities had not received any official invitation. The repair of this omission, and the incitement of a spirited cooperation on the part of the States and cities, formed a large part of the assistant secretary general's task; and he set about it with great intelligence and dispatch, compensating much of the disadvantage of lateness, and contributing much, over and above his specific duties, to the activities of the executive bureau.

The problem of housing the congress was to have been undertaken by a special committee, but the committee on organization went no further in the matter than to appoint a chairman, Dr. Charles D. Walcott. The event showed that no further action was necessary. Application was made to the Bureau of American Republics for space in the Pan-American Union, to the Daughters of the American Revolution for space in Continental Memorial Hall, and to the directors of the Smithsonian Institution for space in the

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New National Museum. All these applications met with favor, and the management of the congress was, in the end, most grateful, not alone for the ample and comfortable spaces thus placed at the disposal of the congress, but also for cordial personal interest and service expended before, during, and after the congress by the house officers and staffs of the Pan-American Union, Continental Memorial Hall, and the New National Museum.

The District of Columbia Committee, under the chairmanship of Mr. John Dolph, with a subcommittee under the chairmanship of Dr. Frank Gibson,[1] undertook to provide much of the entertainment for visiting congressists, and especially to make detailed arrangements for their reception on arrival at Union Station, for hotel accommodations, ease of transit about the city, and the means of seeing places of interest in and around Washington. They arranged excursions to Mount Vernon and elsewhere on the river, a cavalry drill at Fort Myer, an aviation exhibition, and they provided or promoted entertainments for special groups of visitors. The District Committee also gave a general reception at the New National Museum on Thursday evening, September 26.

On Monday afternoon, September 23, the President received the delegates and members of the congress and their ladies in the White House. It was the President's intention to have a garden party, but this was prevented by rain.

The Bureau of American Republics gave a promenade concert on Monday night, September 23, at the Pan-American Union, and it should be noted here that this entertainment occurred at approximately the earliest date upon which both building and grounds could have been used for such a purpose.

In the three years preceding the congress the committee on organization held twenty meetings; the executive committee held thirty-three meetings. The affairs of the congress, after adjournment, were left to the executive committee. At a meeting of the executive committee, held shortly after adjournment, a committee on printing was appointed, consisting of Col. Walter D. McCaw, Hon. E. Dana Durand, and the secretary general. Arrangements were made to have the printing done by the Public Printer, and, considering the volume of manuscript, the time and distance to be covered in transmitting proof to authors in foreign countries, and the heavy pressure exerted by the Congress of the United States upon the Government Printing Office, the transactions of the Fifteenth International Congress on Hygiene and Demography have been published with reasonable expedition.

[1] This subcommittee included Dr. William R. King, Dr. Tom A. Williams, Dr. William C. Woodward, Dr. Frank Gibson, Mr. William J. Eynon, Mr. Edmund S. Wolfe, Mr. F. A. Fenning, Mr. T. C. Dulin, Mr. William F. Gude, Mr. Otto J. De Moll, Mr. H. C. C. Stiles, Col. George F. Schutt, Mr. Granville Hunt, Mr. Thomas Grant.

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A large part of the editorial work, and much editorial responsibility, has fallen upon Mr. Cary R. Sage, who was attached to the congress bureau just before the opening date and who served as recording secretary of Section VIII.

A short statement of the cost of the congress follows. A more detailed statement of the cost of publication can not be made at this time.

RESOURCES.

Appropriated by the Congress of the United States and disbursed by the Department of State		$60,000.00
Receipts of the committee on organization:		
Patrons and contributors	$41,830.00	
Membership	17,539.62	
From other sources	5,580.45	
		64,950.07
		124,950.07

EXPENDITURES.

Personal services	35,091.32	
Stationery, postage, express, traveling expenses, miscellaneous	8,774.96	
Advance printing and engraving	13,862.25	
Exhibition, entertainment, medals, badges, publicity, etc	38,093.49	
Post-adjournment: Clerical, editorial, and other personal services; certificates of award; publication of transactions; cost of distribution; reprints; miscellaneous; possible small surplus	29,128.05	
		124,950.07

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REPORT

OF THE

DIRECTOR OF THE EXHIBITION.

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EXHIBITION OF THE FIFTEENTH INTERNATIONAL CONGRESS ON HYGIENE AND DEMOGRAPHY.

According to the precedent established by the two previous congresses, an exhibition was held in connection with the Fifteenth International Congress on Hygiene and Demography. The exhibition was national in character, and was designed to show the public health and demographic work of the participating States and cities. The official participation of such States and cities was provided for when, in January, 1910, the following joint resolution was passed by Congress:

> *Resolved by the Senate and House of Representatives of the United States of America in Congress assembled*, That the President of the United States be, and he is hereby, authorized and requested to extend an invitation to the governor of each State to appoint a State committee, of not more than five members, to cooperate with the committee on organization in planning and preparing the exhibition.

Pursuant to the provisions of this resolution, the following committees were appointed by the governors of the several States:

STATE COMMITTEES.

ALABAMA.

Dr. W. H. Sanders, Montgomery.
Dr. B. L. Wyman, Birmingham.
Dr. S. W. Welch, Talladega.
Dr. E. D. Bondurant, Mobile.
Dr. E. F. Petty, Decatur.

ARIZONA.

Dr. Edward S. Godfrey, Jr., Phoenix.
Dr. Ancil Martin, Phoenix.
Dr. Francis E. Shine, Bisbee.
Dr. C. E. Yount, Prescott.
Dr. W. V. Whitmore, Tucson.

ARKANSAS.

Dr. Olive Wilson, Paragould.
Dr. J. S. Shibley, Booneville.
Dr. Clark Wood, Fort Smith.
Dr. P. W. Lutterloh, Jonesboro.
Dr. T. E. Fuller, Texarkana.

CALIFORNIA.

Mr. Curtis D. Lindley, San Francisco.
Dr. George C. Pardee, Oakland.
Mr. Frank Wiggins, Los Angeles.
Dr. William F. Snow, Sacramento.

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COLORADO.

Dr. G. M. Blickensderfer, Denver.
Mr. S. P. Morris, Denver.
Dr. S. R. McKelvey, Denver.
Dr. Wm. H. Sharpley, Denver.
Dr. A. G. Taylor, Grand Junction.

CONNECTICUT.

Dr. Edward K. Root, Hartford.
Prof. John J. McCook, Hartford.
Dr. Wm. H. Carmalt, New Haven.
Dr. Seldom B. Overlock, Pomfret.
Prof. F. S. Luther (Alternate), Hartford.
Prof. Leo F. Rettger, New Haven.

DELAWARE.

Dr. Walter S. Hunter, Greenwood.
Dr. Abram E. Frantz, Wilmington.
Dr. James A. Draper, Wilmington.
Dr. William P. Orr, Lewes.
Dr. Charles A. Ritchie, Middletown.

DISTRICT OF COLUMBIA.

Dr. William C. Woodward, Washington.
Mr. Wm. J. Eynon, Washington.
Mr. Thomas Grant, Washington.
Dr. Wilfred M. Barton, Washington.
Rev. John Van Schaick, Jr., Washington.

FLORIDA.

Dr. Chas. E. Terry, Jacksonville.
Dr. Arthur Whitman Underwood, St. Augustine.
Dr. Joseph Leopold North, Miami.
Dr. William D. Nobles, Pensacola.
Dr. Sheldon Stringer, Tampa.

GEORGIA.

Dr. H. F. Harris, Atlanta.
Dr. R. L. Fox, Brunswick.
Dr. J. T. Moncrieff, Columbus.
Dr. A. W. Stirling, Atlanta.
Dr. Howard J. Williams, Macon.

HAWAII.

Dr. John S. B. Pratt, Honolulu.
Dr. William C. Hobdy, Honolulu.
Dr. George W. McCoy, Honolulu.
Dr. J. T. Wayson, Honolulu.
Dr. D. S. Bowman, Hilo.

IDAHO.

Dr. George E. Hyde, Rexburg.
Dr. Ralph Falk, Boise.
Dr. Edwin F. Guyon, Montpelier.
Dr. Ones F. Page, Sandpoint.
Dr. William R. Hamilton, Weiser.

ILLINOIS.

Dr. Frank P. Norbury, Springfield.
Dr. Henry B. Favill, Chicago.
Dr. J. L. Wiggin, East St. Louis.
Dr. George B. Young, Chicago.
Dr. George Thomas Palmer, Springfield.

INDIANA.

Dr. H. H. Sutton, Aurora.
Dr. J. B. Berteling, South Bend.
Dr. Edgar Bond, Richmond.
Dr. James S. Boyers, Decatur.
Dr. James H. Morrison, Hartsville.

IOWA.

Dr. Henry Albert, Iowa City.
Dr. V. L. Treynor, Council Bluffs.
Dr. W. W. Pearson, Des Moines.
Mr. W. B. Barney, Des Moines.
Mr. A. E. Kepford, Des Moines.

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KANSAS.

DR. B. J. ALEXANDER, Hiawatha. DR. S. J. CRUMBINE, Topeka.
MR. WM. J. V. DEACON, Topeka. CHANCELLOR FRANK STRONG, Lawrence.
PRESIDENT HENRY J. WATERS, Manhattan.

LOUISIANA.

DR. OSCAR DOWLING, Shreveport. DR. P. T. TALBOT, New Orleans.
DR. E. S. KELLY, New Orleans. MR. G. C. HUCKABY, Baton Rouge.
DR. J. L. ADAMS, Monroe.

MAINE.

DR. CHARLES D. SMITH, Portland. DR. WILLIAM C. MASON, Bangor.
DR. FREDERICK C. THAYER, Waterville. DR. JOHN L. M. WILLIS, Eliot.
DR. ALBION G. YOUNG, Augusta.

MARYLAND.

MR. N. WINSLOW WILLIAMS, Baltimore. DR. CHARLES H. CONLEY, Frederick.
DR. MARSHALL L. PRICE, Baltimore. DR. JAMES BOSLEY, Baltimore.
DR. GUY STEELE, Cambridge.

MASSACHUSETTS.

DR. LYMAN A. JONES, North Adams. DR. SAMUEL H. DUBGIN, Boston.
DR. MILTON J. ROSENAU, Boston. MR. CHARLES F. GETTEMY, Boston.
PROF. WILLIAM T. SEDGWICK, Boston. DR. MARK W. RICHARDSON, Boston.
DR. ARTHUR T. CABOT, Boston.

MICHIGAN.

DR. THOMAS MORT. KOON, Grand Rapids. DR. EDWARD T. ABRAMS, Hancock.
DR. JOHN HARVEY KELLOGG, Battle Creek. DR. R. L. DIXON, Lansing.
DR. AARON ROBERT WHEELER, St. Louis.

MINNESOTA.

DR. W. A. JONES, Minneapolis. DR. LOUIS B. WILSON, Rochester.
DR. H. E. ROBERTSON, Minneapolis. DR. HIBBERT W. HILL, Minneapolis.
DR. FRANK F. WESBROOK, Minneapolis.

MISSISSIPPI.

DR. WALLER S. LEATHERS, University. DR. DUDLEY W. JONES, Brookhaven.
DR. HYMAN M. FOLKES, Biloxi. DR. ROBERT S. CURRY, Jackson.
DR. HUGH L. SUTHERLAND, Rosedale.

MISSOURI.

DR. F. B. HILLER, Jefferson City. DR. E. F. ROBINSON, Kansas City.
DR. GEORGE DOCK, St. Louis. DR. JACOB GEIGER, St. Joseph.
DR. WALTER MCNAB MILLER, Columbia.

MONTANA.

DR. THOMAS D. TUTTLE, Helena. DR. W. F. COGSWELL, Livingston.
DR. F. D. PEAS, Missoula. DR. C. E. K. VIDAL, Great Falls.
DR. M. A. WALKER, Dillon.

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NEBRASKA.

Dr. E. Arthur Carr, Lincoln.
Dr. Herschell B. Cummins, Seward.
Dr. Porter F. Dodson, Wilber.
Dr. Clifford P. Fall, Beatrice.
Dr. William H. Wilson, Lincoln.

NEVADA.

Dr. William H. Hood, Reno.
Dr. John A. Lewis, Reno.
Dr. O. P. Johnstone, Reno.
Dr. S. L. Lee, Carson.
Dr. D. Ashley Turner, Goldfield.

NEW HAMPSHIRE.

Dr. Irving A. Watson, Concord.
Dr. William H. Leith, Lancaster.
Mr. William K. Robins, Manchester.

NEW JERSEY.

Dr. A. Clark Hunt, Metuchen.
Dr. Stewart A. Paton, Princeton.
Dr. Richard Cole Newton, Montclair.
Dr. George E. McLaughlin, Jersey City.
Dr. Henry A. Cotton, Trenton.

NEW MEXICO.

Dr. James J. Shuler, Raton.
Dr. Robert E. McBride, Las Cruces.
Dr. John W. Elder, Albuquerque.
Mr. G. T. Veal, Roswell.
Dr. George E. Bushnell, Fort Bayard.

NEW YORK.

Dr. Henry L. K. Shaw, Albany.
Dr. Joseph D. Bryant, New York City.
Dr. Eugene H. Porter, Albany.
Dr. Luther H. Gulick, New York City.
Mr. Edward T. Devine, New York City.

NORTH CAROLINA.

Dr. L. D. McBrayer, Asheville.
Dr. R. H. Lewis, Raleigh.
Dr. R. S. Young, Concord.
Dr. W. S. Rankin, Raleigh.
Dr. J. A. Ferrell, Raleigh.

NORTH DAKOTA.

Dr. Eric P. Quain, Bismarck.
Dr. Edw. M. Darrow, Fargo.
Dr. James Grassick, Grand Forks.
Dr. Bernard D. Verret, Rolla.

OHIO.

Dr. Roger G. Perkins, Cleveland.
Dr. George A. Fackler, Cincinnati.
Dr. Walter W. Brand, Toledo.
Dr. John H. J. Upham, Columbus.
Dr. Charles W. King, Dayton.

OKLAHOMA.

Dr. Francis B. Fite, Muskogee.
Dr. C. A. Thompson, Muskogee.
Dr. G. W. Stewart, Hobart.
Dr. Ed Mayberry, Enid.
Dr. A. S. Risser, Blackwell.
Dr. J. J. Williams, Weatherford.
Dr. Walter Hardy, Ardmore.
Dr. Jos. B. Rolater, Oklahoma City.
Dr. J. C. Mahr, Oklahoma City.
Dr. I. B. Oldham, Muskogee.
Dr. J. W. Duke, Guthrie.
Dr. Louis Bagby, Vinita.
Dr. Dock Long, Duncan.
Dr. Z. J. Clark, Cherokee.
Dr. E. N. Allen, McAlester.
Dr. James L. Shuler, Durant.

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OREGON.

DR. CALVIN S. WHITE, Portland.
MRS. W. B. AYER, Portland.
MRS. A. E. ROCKEY, Portland.
DR. CHARLES J. SMITH, Pendleton.
MRS. ROBERT TATE, Portland.

PENNSYLVANIA.

DR. FRANK GIRARD, Pittsburgh.

RHODE ISLAND.

DR. A. B. BRIGGS, Ashaway.
DR. CHAS. V. CHAPIN, Providence.
MR. SAMUEL L. GRAY, Providence.
DR. WM. C. MONROE, Woonsocket.
DR. GARDNER T. SWARTS, Providence.

SOUTH DAKOTA.

DR. L. G. HILL, Watertown.
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DR. JOHN A. WITHERSPOON, Nashville.
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DR. S. M. MILLER, Knoxville.

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DR. A. L. LINCECUM, El Campo.
DR. J. M. LOVING, Austin.
DR. O. L. HALBETT, Waco.
DR. JOHN T. MOORE, Houston.

UTAH.

DR. THEODORE BEATTY, Salt Lake City.
DR. HERBERT A. ADAMSON, Richmond.
DR. SAMUEL G. PAUL, Salt Lake City.
DR. J. W. PIDCOCK, Ogden.
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DR. ELISHA BARKSDALE, Lynchburg.
DR. DOUGLAS S. FREEMAN, Richmond.
DR. ERNEST C. LEVY, Richmond.
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DR. ELMER E. HEG, Seattle.
DR. J. W. BEAN, Tacoma.
DR. J. E. CRICHTON, Seattle.
DR. ALBERT P. DUBYEE, Everett.
DR. WILSON JOHNSTON, Spokane.

WEST VIRGINIA.

DR. JOHN L. DICKEY, Wheeling.
DR. WM. W. TOMPKINS, Charleston.
DR. OSWALD O. COOPER, Hinton.
DR. JOHN N. SIMPSON, Morgantown.
DR. LEWIS VAN GUTHRIE, Huntington.

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WISCONSIN.

DR. C. A. HARPER, Madison.
HON. J. D. BECK, Madison.
DR. T. L. HARRINGTON, Milwaukee.
DR. HUGO C. REICH, Sheboygan.
MRS. JULIA KURTZ, Milwaukee.

WYOMING.

DR. ANNA G. HURD, Sheridan.
DR. HERBERT T. HARRIS, Basin.
DR. D. E. BROWN, Laramie (deceased).
DR. W. G. OWEN, Buffalo.
DR. W. A. WYMAN, Cheyenne.

In order better to insure the participation of the Federal bureaus, the Secretary of State invited the Secretary of the Treasury to form an interdepartmental committee composed of representatives from the several Federal bureaus doing public health and demographic work, in order to correlate the exhibits of such bureaus. The following Federal bureaus took part in the exhibition:

Treasury Department:
- Public Health Service.

War Department:
- Quartermaster Department.
- Commissary Department.
- Medical Department of the Army.

Navy Department:
- Bureau of Equipment.
- Bureau of Medicine and Surgery.

Department of Agriculture:
- Bureau of Animal Industry.
- Bureau of Chemistry.
- Bureau of Entomology.
- Experiment Stations.

Department of the Interior:
- Bureau of Education.
- Bureau of Mines.

Department of Commerce and Labor:
- Bureau of the Census.
- Bureau of Immigration and Naturalization.

One difficulty which confronted the committee on organization was the fact that no suitable building existed in Washington in which such an exhibition might be held. Fortunately, however, the American Red Cross intended to hold an exhibition in connection with their annual conference in May, 1912. They decided to build a temporary structure for the purpose, and they proposed to the committee on organization of the Fifteenth International Congress on Hygiene and Demography that that committee should meet one-half the expenses of construction, with the understanding that after the Red Cross had finished with the structure it should be turned over to the Fifteenth International Congress on Hygiene and Demography, provided the necessary authorization from Congress could be obtained for the continuance of the temporary structure on

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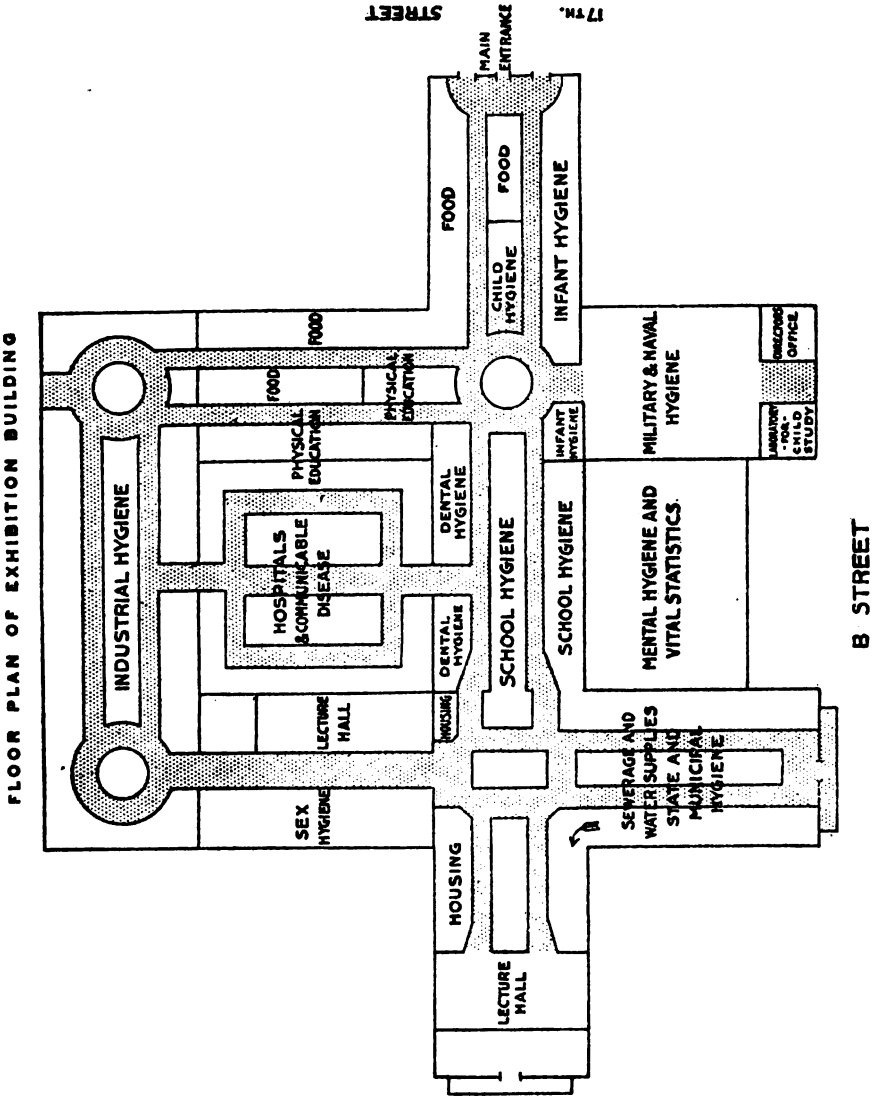
the site placed at their disposition by previous joint resolution. The joint resolution authorizing the use of this structure by the Fifteenth International Congress on Hygiene and Demography passed Congress on June 10, 1912.



As the original building constructed by the Red Cross provided a floor area of but 17,500 square feet, it became necessary to enlarge the structure so that at least 50,000 square feet could be provided. This was done by the committee on organization, and the work was at once undertaken upon the passage of the above-mentioned joint

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resolution. The contractors in charge of the work pushed construction so rapidly that it was possible to take possession of the building for purposes of installation on August 26, 1912.

In installing the exhibition, a choice of two methods was offered: First, a geographical arrangement under which exhibits would be grouped according to the States from which they were derived; and second, a topical arrangement under which the material would be classified into subjects. The committee on organization adopted the latter plan, and accordingly the subject-material was grouped into the following sections:

Hygiene of Infancy and Childhood.
Sanitary Control of Food and Food Supplies.
School Hygiene.
Oral Hygiene.
Hygiene of Exercise.
Industrial Hygiene.
Military and Naval Hygiene.
Sex Hygiene.
Mental Hygiene.
Communicable Diseases and Hospitals.
Sewage and Water Supplies.
State and Municipal Hygiene.
Housing.
Vital Statistics.

The exhibition was notable from the fact that for the first time in this country such grouping of the material for exhibition was followed out, and it was found that it added much to the general effectiveness of the display.

Two subjects were treated at the exhibition more extensively than in previous instances in this country, namely, the subjects of sex hygiene and mental hygiene. Both these exhibits attracted a great deal of attention.

A lecture hall was also constructed in connection with the exhibition building, fitted with projection apparatus of various kinds, in which the following course of lectures was given under the direction of Dr. Norman Roberts, of the United States Public Health Service, assistant director of the exhibition:

LECTURES DELIVERED IN THE LECTURE HALL ARRANGED BY THE ASSISTANT DIRECTOR.

Moving pictures every day from 11.30 until the first lecture and in the intermissions until 9 p. m.

MONDAY, September 16.

Formal opening, 8 p. m.

TUESDAY, September 17.

2.30. J. E. Curtis, Washington Filtration Plant,
The Engineering Work of the Washington Filtration Plant.
3.00. Dr. L. F. Kebler, United States Department of Agriculture,
Dangers in Patent Medicines.

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3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
7.30. The Same.
8.30. Dr. Stewart Paton, Princeton University,
The Campaign for Mental Hygiene.

WEDNESDAY, September 18.

2.00. R. B. Dole, United States Geological Survey,
The Public Health Work of the United States Geological Survey.

THURSDAY, September 19.

2.30. Miss Harlean James, Women's Civic League, Baltimore,
The Movement for Improved Housing Conditions in Baltimore.
3.00. Dr. L. F. Kebler, United States Department of Agriculture,
Habit-Forming Agents.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Dr. Leo Solbach, National Mouth Hygiene Association,
Mouth Deformities and Their Correction.
7.30 to 10. United States Marine Band.

FRIDAY, September 20.

2.30. R. B. Dole, United States Geological Survey,
The Public Health Work of the United States Geological Survey.
3.00. W. F. Wells, Wagner Filtration Plant,
Chemistry of Water Purification.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Dr. Tom A. Williams, Washington, D. C.,
Nervousness in Children.
4.30. Dr. L. F. Kebler, United States Department of Agriculture,
Dangers of Self-Medication in Tuberculosis.
8.00. Dr. Leo Solbach, National Mouth Hygiene Association,
Mouth Deformities and Their Correction.

SATURDAY, September 21.

2.00. Dr. S. A. Knopf, New York City,
What Everybody Should Know and Do in the Fight against Tuberculosis.
2.30. Dr. F. Shoemaker, United States Indian Service,
Tuberculosis and Trachoma among the Indians.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Dr. Elnora C. Folkmar, Washington, D. C.,
The Hygiene of Adolescence (women only).
7.30 to 9.30. Symposium on Milk, chairman, E. Berliner, Washington, D. C.

MONDAY, September 23.

1.30. P. A. Merriam, chief electrician, United State Navy.
The Round-the-World Cruise of the United States Battleship Fleet.
2.30. Dr. C. J. Blake, Harvard Medical School,
Reasons for the Supression of Noise.

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5.30. Dr. Med. F. Fülleborn, Hamburg, Germany,
Demonstrations of Transmission of Strongyloides and Mosquito-Borne Infections.
7.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
8.00. Passed Asst. Surg. A. J. McLaughlin, United States Public Health Service,
Typhoid.
8.30. R. B. Dole, United States Geological Survey.
The Public Health Work of the United States Geological Survey.
9.00. Mr. J. W. Erwin, San Francisco, Cal.,
Travel and Recreation in the West.
9.30. Dr. H. H. Goddard, Vineland, N. J.,
Idiots, Imbeciles, and Morons.

SATURDAY, September 28.

10.30. Dr. Elnora C. Folkmar, Washington, D. C.,
Birth of a New Life, part 3 (for children).
12.15. Mr. H. K. Bush-Brown, Washington, D. C.,
The People's Foundation.
1.45. Dr. A. J. Orenstein, Isthmian Canal Commission,
Sanitation on the Canal.
2.30. Dr. Leo Solbach, National Mouth Hygiene Association,
Mouth Deformities and Their Correction.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Miss Reinhardt, Kensington, Md., and others,
Methods of Training Defective and Normal Children.
5.00. Mr. J. W. Erwin, San Francisco, Cal.,
Travel and Recreation in the West.
7.30 to 10. Fifteenth Cavalry Band.

MONDAY, September 30.

2.00. Mr. J. B. Vining, Department of Charities and Corrections, Cleveland, Ohio,
Cleveland's Municipal Farms.
3.00. R. B. Dole, United States Geological Survey,
Mineral Matter in Natural Waters.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Dr. Sara Craig Buckley, Chicago, Ill.,
Our Growing Children (read).
4.30. Dr. J. A. Murphy, United States Indian Service,
Tuberculosis and Trachoma among the Indians.
7.30. Mr. Hugo Ernst, Dayton, Ohio.
Welfare Work of an Industrial Corporation.
8.00. Dr. B. M. Randolph, Washington, D. C.,
The Abuse of Drugs.
8.30. Dr. Elnora C. Folkmar, Washington, D. C.,
The Red Plagues (Gonorrhea).
9.00. Dr. G. L. Magruder, Washington, D. C.,
Milk.

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TUESDAY, October 1.

2.00. Mr. Lewis E. Warren, American Medical Association, Chicago, Ill.,
Deleterious Patent Medicines.
3.00. Dr. E. P. Magruder, Washington, D. C.,
What To Do While the Doctor is Coming.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Dr. Elnora C. Folkmar, Washington, D. C.,
Prevention and Control of the Red Plagues.
4.30. E. P. Cowell, Franklin Institute, Philadelphia, Pa.,
The Making of a Newspaper.
7.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
8.00. Dr. E. H. Egbert, Washington, D. C.,
Quack Mechanotherapy.
8.30. Dr. W. M. Barton, Washington, D. C.,
Self-medication.
9.00. Dr. Elnora C. Folkmar, Washington, D. C.,
The Red Plagues (Syphilis).

WEDNESDAY, October 2.

2.00. Asst. Surg. R. A. Kearny, United States Public Health Service,
Alaska.
2.30. Dr. C. I. Griffith, Washington, D. C.,
Poisonings.
3.00. Mr. A. E. Phillips, Sewer Department, Washington, D. C.,
The Sewer System of Washington.
3.30. Mr. Hugo Ernst, Dayton, Ohio.
Welfare Work of an Industrial Corporation.
4.00. E. P. Cowell, Franklin Institute, Philadelphia, Pa.,
A Hygienic Ice Cream Factory.
4.30. Mr. Lewis E. Warren, American Medical Association, Chicago, Ill.,
Deleterious Patent Medicines.
5.00. Dr. Elnora C. Folkmar, Washington, D. C.,
Hygiene of Adolescence (women and girls over 14).
7.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
8.00. R. B. Dole, United States Geological Survey,
Mineral Matter in Natural Waters.
8.30. Dr. W. C. Woodward, Health Officer, District of Columbia,
Mortality as Affected by Race.

THURSDAY, October 3.

2.00. Dr. H. C. Macatee, Washington, D. C.,
How Medical School Inspection Benefits Your Child.
2.30. Dr. Carl Henning, Washington, D. C.,
Care of the Eyes.
3.00. Dr. W. D. Fry, Washington, D. C.,
Hygiene of Motherhood.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Dr. W. D. Bigelow, United States Department of Agriculture,
Various Food-Manufacturing Processes.

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4.30. Passed Asst. Surg. B. S. Warren, United States Public Health Service,
Outdoor Schools.
7.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
8.00. Dr. C. A. Simpson, Washington, D. C.,
How Early Diagnosis Lessens the Mortality from Cancer.
8.30. Dr. Tom A. Williams, Washington, D. C.,
The Truth About Mental Healing.

FRIDAY, October 4.

2.00. R. B. Dole, United States Geological Survey,
Mineral Matter in Natural Waters.
3.00. Dr. W. A. Wells, Washington, D. C.,
The Origin of Colds and the Prevention of Catarrh.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Dr. W. P. Carr, Washington, D. C.,
The Use and Abuse of Suggestion in Medicine.
4.30. Dr. George H. Heitmüller, Washington, D. C.,
The Ideal Eye and Deviations Therefrom.
5.00. Dr. Elnora C. Folkmar, Washington, D. C.,
The Birth of a New Life (summary).
7.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
8.00. Dr. A. J. McKelway, National Child Labor Committee,
Street Trades in the District of Columbia.
8.30. Capt. A. C. Christie, Medical Corps, United States Army,
Venereal Disease (for men only).

SATURDAY, October 5.

2.00. Mr. J. E. Curtis, Washington Filtration Plant,
Washington's Water Supply.
2.30. Dr. Arthur Murray, District of Columbia Health Office,
Flies.
3.00. E. P. Cowell, Franklin Institute, Philadelphia, Pa.
Concrete and Its Sanitary Uses.
3.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
4.00. Dr. W. D. Bigelow, United States Department of Agriculture,
The Attitude of Food Manufacturers to the Pure-Food Law.
4.30. Miss Reinhardt, Kensington, Md.,
The Training of Deaf Children.
7.30. Mr. Hugo Ernst, Dayton, Ohio,
Welfare Work of an Industrial Corporation.
8.00. Symposium, Washington's Health Needs,
Chairman: W. S. Ufford, general secretary Associated Charities.

These lectures were largely attended and formed one of the most successful features of the exhibition.

A large number of moving-picture films on various health topics were shown, of which the following list may be of interest:

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MOVING-PICTURE FILMS USED.

Midwinter Sports.
Boil Your Water.
Athletic Carnival.
The Wedding Bell.
On the Trail of the Germs.
Rented from Madame R. G. Dolesi, Educational Department, General Film Co., 200 Fifth Avenue, New York City.
The Public and Private Care of Infants.
Loaned by the Russell Sage Foundation, Department of Child Helping, Miss Ellen C. Babbitt.
Educational film of the National Mouth Hygiene Association.
Loaned by Dr. W. G. Ebersole, 800 Schofield Building, Cleveland, Ohio.
Film owned by the State Hospital Commission, Albany, N. Y.
Loaned by the commission.
Venereal film, the original of which belongs to the National Cash Register Co., Dayton, Ohio, one copy of which has been made for the Army. The Army copy was loaned to us. It might be possible to get same from the National Cash Register Co.
The National Cash Register Co. also gave lectures with moving pictures on welfare work among their employees.
New Lease on Life.
Loaned by Raybrook State Hospital for Incipient Tuberculosis, Raybrook, N. Y.
For the Commonwealth.
Loaned by the National Committee of Prison Labor through the New York Committee on Exhibits.
Hull House.
Loaned by Hull House through Miss Julia C. Lathrop, Children's Bureau, Washington, D. C.
From Cow to Consumer (2 reels and slides).
Loaned by Sheffield Farms-Slawson-Decker Co., New York City.
The Red Cross Seal.
The Awakening of John Bond.
Loaned by the National Association for the Study and Prevention of Tuberculosis, New York City.
Seabreeze.
Loaned by the New York Association for Improving the Condition of the Poor, New York City.
3 reels concerning Baltimore, Maryland.
Loaned by the Maryland Committee through Mr. John S. Fulton, jr.

The small lecture hall was run entirely under the supervision of the American Federation for Sex Hygiene, New York City, and all films shown by them were not under our care. The films were rented from the educational department, General Film Co.

The Care of Babies.
Loaned by Dr. H. L. K. Shaw, 361 State Street, Albany, N. Y.

The American Federation for Sex Hygiene also constructed a smaller lecture hall in which a course of special lectures on sex hygiene and its related topics was given, illustrated with slides and moving-picture films, which contributed in no small degree to the success of the entire project.

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It had been decided by the committee on organization that diplomas of superior merit and merit should be given to exhibits worthy of such distinction. The following jury of awards was appointed by the executive committee:

MAJ. FREDERICK F. RUSSELL, Chairman,
United States Army Medical School.
MR. R. B. DOLE,
United States Geological Survey.
MR. HENRY J. HARRIS,
Chief, Division of Documents, Library of Congress.
DR. ALES HRDLICKA,
Assistant Curator, New National Museum.
DR. REID HUNT,
Chief, Division of Pharmacology, Hygienic Laboratory, United States Public Health Service.
DR. S. N. D. NORTH,
Carnegie Endowment for International Peace.
DR. J. W. SCHEREschewsky,
United States Public Health Service (ex officio).
DR. TOM A. WILLIAMS,
Washington, D. C.
DR. WILLIAM C. WOODWARD,
Health officer for the District of Columbia.

And after close examination of the various sections of the exhibition they recommended that such diplomas be awarded to the following exhibitors:

Diplomas for superior merit to—

American Association for Study and Prevention of Infant Mortality,
For an exhibit on the prevention of undue infant mortality.

Bureau of Chemistry, United States Department of Agriculture,
For an exhibit of the work of the bureau in relation to pure foods and drugs.

Oral Hygiene Committee of The National Dental Association; and
National Mouth Hygiene Association,
For an exhibit on oral hygiene.

Department of Education of the city of New York,
For an exhibit of its work in physical training.

Massachusetts State Board of Health,
For an exhibit on the hygiene of occupations.

The Prudential Insurance Co. of America,
For an exhibit on the mortality of occupations.

Experimental Shoe Board, War Department,
For an exhibit of the work of this board.

Medical Department, United States Army,
For an exhibit showing the investigation and methods of eradication of certain communicable diseases.

The National Committee for Mental Hygiene,
For exhibits illustrating—
(*a*) Causes of the apparent increase of insanity.
(*b*) Heredity of feeblemindedness.
(*c*) Means for the prevention of insanity.

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American Museum of Natural History,
For an exhibit of glass models of pathogenic bacteria.
American Museum of Natural History,
For an exhibit on pollution of water and purification of water and sewage.
Sewer Department, District of Columbia,
For an exhibit illustrating the construction and maintenance of sewers.
Massachusetts State Board of Health,
For an exhibit of its work in State and municipal hygiene.
American Federation for Sex Hygiene,
For an exhibit on methods of teaching sex hygiene.
American Medical Association,
For an exhibit of dangerous or fraudulent patent medicines.
The State Board of Health of California,
For an exhibit of an educational exhibit installed in a railway coach.

Diplomas of merit to—

Division of Child Hygiene, Department of Health of the city of New York,
For an exhibit of the work of prevention of undue infant mortality of that division.
Babies' Hospital of Newark, N. J.,
For an exhibit of a ward in that hospital.
Division of Child Hygiene, Department of Health of the city of Boston,
For an exhibit on the mortality of infants in Boston, Mass.
The Louisa M. Alcott Club, of Boston,
For an exhibit of methods of teaching hygiene to children.
Valparaiso High School, Indiana,
For an exhibit on dental hygiene prepared by the pupils.
Bureau of Education, Department of the Interior,
For an exhibit of knock-down model rural schoolhouses.
The Embossing Company, of Albany, N. Y.,
For an exhibit of educational toys.
Department of Psychology and Education, Cornell University,
For an exhibit of apparatus for determining mentality.
New York State Department of Education,
For an exhibit of hygienic school conditions.
The New York State Department of Agriculture,
For an exhibit on the work of that department in relation to the pure food laws.
The Division of Food Inspection, Boston City Department of Health,
For an exhibit on the work of that division.
Scientific Temperance Federation of Boston,
For an exhibit on the effects of alcohol.
Department of Physiology, Cornell University Medical College,
For an exhibit of the work of that department in nutrition.
Bureau of Animal Industry, United States Department of Agriculture,
For an exhibit on the inspection of meat and milk.
The International Committee of Young Men's Christian Associations,
For an exhibit of their work in promoting physical and moral education.
Dr. Dudley Allen Sargent,
For an exhibit of photographs of types of athletes and anthropometrical charts.
Department of Physical Education, University of Wisconsin,
For an exhibit of the work of that department.
The Boy Scouts of America,
For an exhibit showing their work.

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The Public Athletic League of Maryland,
For an exhibit showing the work and results accomplished by that league.
New York State Department of Labor,
For an exhibit showing the hygiene of industries in that State.
Bureau of Mines, United States Department of the Interior,
For an exhibit of life-saving apparatus and methods in mines.
National Cash Register Co.,
For an exhibit showing their welfare work for the benefit of employees.
Medical Department of the United States Army,
For an exhibit of a field hospital.
Medical Department of the United States Army,
For an exhibit of a field filtering apparatus.
Quartermaster's Department, United States Army,
For an exhibit of tents and clothing.
Commissary Department, United States Army,
For an exhibit of a field bakery.
Bureau of Medicine and Surgery, Department of the Navy,
For an exhibit of a battleship operating room.
Bureau of Equipment, Department of the Navy,
For an exhibit of galley equipment on United States naval vessels.
Naval Medical School,
For an exhibit of its methods of instruction.
American Federation for Sex Hygiene,
For an exhibit on eugenics.
American Federation for Sex Hygiene,
For an exhibit of the work accomplished by the Portland Society of Social Hygiene.
Dr. Elnora C. Folkmar,
For an exhibit of lantern slides on sex hygiene.
New York State Hospital Commission,
For an exhibit of methods of caring for the insane.
The Department of Health, Asheville, N. C.,
For an exhibit on fly-breeding and its prevention.
Maryland State Board of Health.
For an exhibit on communicable diseases and their prevention.
Laboratory Division, Department of Health of the city of New York,
For an exhibit of biological products and methods of laboratory diagnosis.
Department of Health of the city of New York,
For an exhibit of literature in various languages on disease and its prevention.
Virginia State Board of Health,
For an exhibit of popular bulletins on disease distributed by that board.
United States Public Health Service,
For an exhibit on communicable diseases.
Boston City Department of Health,
For an exhibit of bacteriological apparatus.
Ernst Leitz,
For an exhibit of microscopes.
Rockefeller Sanitary Commission (in coöperation with State boards of health and the Public Health Service),
For an exhibit on the prevalence of hookworm disease and its eradication.
Department of Sanitary Engineering, College of Civil Engineering, Cornell University,
For an exhibit of its practical methods of instruction.

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Massachusetts Institute of Technology,
For an exhibit on biological research.
Laboratory Division, Minnesota State Board of Health,
For an exhibit of a portable apparatus for the hypochlorite disinfection of water.
Board of Water Supply, New York City,
For an exhibit showing methods of sanitary control in construction camps.
Medical Department, United States Army,
For an exhibit of apparatus for the disinfection of water by chlorine gas.
New York State Department of Health,
For an exhibit of its work in State and municipal hygiene.
The Pullman Co.,
For an exhibit on the ventilation of sleeping cars.
City of Seattle, Wash.,
For an exhibit of work in municipal hygiene.
The Maryland Association for the Prevention and Relief of Tuberculosis,
For a traveling educational exhibit, installed in a railway coach.
Bureau of the Census, Department of Commerce and Labor,
For an exhibit of charts and tabulating machines.
Bureau of Records, Department of Health of the city of New York,
For an exhibit of statistical charts and models.
Bureau of Vital Statistics, Maryland State Department of Health,
For an exhibit on needs and methods of collecting vital statistics.
The State Board of Health of Louisiana,
For a popular exhibit of hygiene installed in a railway coach.

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LIST OF EXHIBITORS AT THE EXHIBITION OF THE FIFTEENTH INTERNATIONAL CONGRESS ON HYGIENE AND DEMOGRAPHY.

AETNA LIFE INSURANCE Co., Hartford, Conn.
Photographs and material showing need of safety devices.

AGRICULTURE, DEPARTMENT OF, Washington, D. C.

Bureau of Animal Industry—
Model of dairy barn, cases of specimens, pictures, refrigerator with samples of diseased meat.

Bureau of Chemistry—
Infant and invalid foods, bacteriological exhibit, adulteration of foods and drugs, et cetera.

Bureau of Entomology—
Case of germ-carrying insects.

Experiment Stations—
Ergometer, case of models, photographs, charts.

ALBANY BUREAU OF HEALTH, Albany, N. Y.
Charts and photographs.

ALBANY DEPARTMENT OF PUBLIC WORKS, Albany, N. Y.
Landscape model of a filtration plant.

ALBANY HOME BUILDING Co., Albany, N. Y.
Plans and photographs.

AMERICAN ASSOCIATION FOR LABOR LEGISLATION, New York City.
Photographs and charts on occupational diseases.

AMERICAN ASSOCIATION FOR STUDY AND PREVENTION OF INFANT MORTALITY, Baltimore, Md.
Photographs, charts, pictures, models, and working models.

AMERICAN CONCRETE STEEL Co., Newark, N. J.
Photographs and models of concrete schoolhouses.

AMERICAN FEDERATION FOR SEX HYGIENE, New York City.
Charts, pictures, legends, maps, models, and literature for teaching sex hygiene. (Lectures and moving pictures.)

AMERICAN IRON & STEEL INSTITUTE, New York City.
Photographs and models of safety appliances with contributions by American Blower Co., New York City; American Steel Foundries, Chicago, Ill.; Empire Steel & Iron Co., Wharton, N. J.; Lackawanna Steel Co., Buffalo N. Y.; Norton Co., Worcester, Mass.

AMERICAN MEDICAL ASSOCIATION, Chicago, Ill.
Dangerous or fraudulent patent medicines.

AMERICAN MUSEUM OF NATURAL HISTORY, New York City.
Transparencies, charts, and models concerning communicable disease and State and municipal hygiene.

AMERICAN MUSEUM OF SAFETY, New York City.
Photographs and models of safety devices.

AMERICAN PUBLIC HEALTH ASSOCIATION, New York City.
Charts and literature.

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AMERICAN SEATING CO., Chicago, Ill.
School furniture.
AMERICAN TELEPHONE & TELEGRAPH CO., New York City.
Photographs, charts, diagrams, and models showing welfare work.
ASBESTOLITH CO., New York City.
Samples of material.
ASHEVILLE BOARD OF HEALTH, Asheville, N. C.
Models, et cetera, on fly breeding and its prevention.
BABIES' DISPENSARY AND HOSPITAL, Cleveland, Ohio.
Charts, maps, models.
BABIES' HOSPITAL, Newark, N. J.
Miniature ward.
BARACH, DR. JOSEPH H., Pittsburgh, Pa.
Charts and photographs.
BARRETT MANUFACTURING CO., New York City.
Apparatus and samples of disinfectants.
BASS, DR. C. C., New Orleans, La.
Microscopes with slides showing bacteria.
BELLEVUE AND ALLIED HOSPITALS, New York City.
Photographs and charts.
BOARD OF CHARITIES OF SAN FRANCISCO, Cal.
Photographs.
BOSTON ASSOCIATION FOR THE RELIEF AND CONTROL OF TUBERCULOSIS, Boston, Mass.
Photographs, charts, and maps.
BOSTON CITY DEPARTMENT OF HEALTH, Boston, Mass.
Charts, photographs, maps, literature, and models.
BOSTON CITY HOSPITAL, Boston, Mass. (south department).
Charts showing statistics of contagious diseases.
BOSTON CONSUMPTIVES' HOSPITAL, Boston, Mass.
Cabinet, models, and charts.
BOSTON DISPENSARY, Boston, Mass.
Charts and photographs.
BOSTON HEALTH EDUCATION LEAGUE, Boston, Mass.
Photographs.
BOSTON MILK & BABY HYGIENE ASSOCIATION, Boston, Mass.
Photographs and charts.
BOSTON UNIVERSITY SCHOOL OF MEDICINE, Boston, Mass.
Pathological specimens.
BOY SCOUTS OF AMERICA, New York City.
Charts, clothing, literature, and demonstrations.
BUFFALO DEPARTMENT OF HEALTH, Buffalo, N. Y.
Charts and photographs.
BUFFALO FORGE CO., Buffalo, N. Y.
Full-sized working model of air-washing machine.
BUREAU OF MUNICIPAL RESEARCH, New York City.
Literature.
CAMP FIRE GIRLS OF AMERICA, New York City.
Clothing, trinkets, samples of work, literature, photographs, model of camp, and demonstrations.
CAMPBELL, MISS MARY R., AND OTHERS, Chicago, Ill.
Working pedologic laboratory.

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CARNEGIE NUTRITION LABORATORY, Boston, Mass.
Photographs and charts.

CHILD HYGIENE COMMITTEE, Philadelphia, Pa.
Photographs of baby-saving show.

CHILDREN'S AID SOCIETY SCHOOL, New York City.
Dental clinic exhibit (photographs), literature.

CINCINNATI DEPARTMENT OF HEALTH, Cincinnati, Ohio.
Charts, pictures, and photographs.

CLEVELAND DEPARTMENT OF CHARITIES AND CORRECTION, Cleveland, Ohio.
Plaster model of farms, photographs, and literature.

COLORADO STATE COMMITTEE, Denver, Colo.

Agnes Memorial Sanitorium for the Tuberculous—
Photographs.

Corwin, Dr. R. W., Pueblo—
Photographs on school hygiene.

Denver City Tramway Co.—
Photographs.

Denver Gas & Electric Co.—
Illuminated photographs, pictures, and transparencies.

Denver Playground Association—
Map and photographs.

Minnequa, Hospital of Colorado Fuel & Iron Co., Pueblo—
Photographs.

Water Supply of the City of Denver—
Charts and photographs.

COMMERCE AND LABOR, DEPARTMENT OF, Washington, D. C.

Bureau of the Census—
Machines used in compiling statistical records.

Bureau of Immigration and Naturalization—
Photographs showing types of immigrants and immigration stations.

COMMITTEE ON PREVENTION OF TUBERCULOSIS OF THE CHARITY ORGANIZATION SOCIETY, New York City.
Photographs showing fresh-air classes in public schools.

CORNELL UNIVERSITY, Ithaca, N. Y.

Department of Physical Education—
Charts and photographs.

Department of Psychology and Education—
Apparatus, with demonstrations, used in an educational psychological laboratory.
Apparatus loaned by C. H. Stoelting Co., Chicago, Ill.

Department of Sanitary Engineering—
Charts and photographs.

New York State College of Agriculture—

Department of Poultry Husbandry—
Models of apparatus for candling eggs, and transparency.

Department of Home Economics—
Wall panels, photographs, model of an efficiency cupboard, and exhibit of hygienic infant clothes.

CORNELL UNIVERSITY MEDICAL COLLEGE, New York City.

Physiological Laboratory—
Charts, photographs, and models.

CORPORATION OF TRINITY CHURCH, New York City.
Pictures and models showing housing conditions.

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CRONK, DR. H. T., New York City.
Miniature model of end of passenger car showing toilet room with sanitary device.

DE LAVAL SEPARATOR CO., New York City.
Models of milk-clarifying machines.

DISTRICT OF COLUMBIA.
Board for the Condemnation of Insanitary Buildings—
Diagrams, maps, and photographs.
Engineer Department—
Bureau of Sewers—
Models showing construction and maintenance of sewers.
Bureau of Street Cleaning—
Photographs.
Health Department—
Charts, photographs, and maps.
Instructive Visiting Nurse Society—
Photographs, models, and materials.
The Washington Filtration Plant—
Photographs.

DOW WIRE & IRON WORKS, Louisville, Ky.
Model of spiral fire escape.

DRAPER SHADE CO., LUTHER O., Spiceland, Ind.
Working model of adjustable window shade.

EAST RIVER HOMES, New York City.
Photographs.

ELIZABETH MCCORMICK MEMORIAL FUND, Chicago, Ill.
Pictures, photographs, and models.

EMBOSSING CO., THE, Albany, N. Y.
Educational and sanitary toys and model of baby cariole.

FISHER, PROF. IRVING, New Haven, Conn.
Models, photographs, and pamphlets.

FLORIDA STATE BOARD OF HEALTH, Jacksonville, Fla.
Chart.

FOLKMAR, DR. ELNORA C., Washington, D. C.
Literature and lantern slides for teaching sex hygiene.

GAYLORD FARM SANATORIUM, Wallingford, Conn.
Charts, records, and photographs.

GIER & DAIL MANUFACTURING CO., Lansing, Mich.
Bubble fountain and sanitary bread basket.

HARTFORD BOARD OF HEALTH, Hartford, Conn.
Statistical charts, showing birth and death rates.

HARVARD MEDICAL SCHOOL, Boston, Mass.
Department of Preventive Medicine—
Charts and photographs.

HARVARD UNIVERSITY, Cambridge, Mass.
Social Ethics Museum—
Charts and photographs.

HEINZ CO., H. J., Pittsburgh, Pa.
Photographs.

HOWARD DUSTLESS DUSTER CO., Boston, Mass.
Samples of manufactured articles.

INDIANA STATE BOARD OF HEALTH, Indianapolis, Ind.
Charts, statistics, diagrams, and photographs relating to various phases of hygienic work; models.

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INDIANAPOLIS DEPARTMENT OF PUBLIC HEALTH AND CHARITIES, Indianapolis, Ind.
Charts and photographs.

INSTITUTE OF INDUSTRIAL RESEARCH, Washington, D. C.
Panels of sanitary wall surface.

INTERIOR, DEPARTMENT OF, Washington, D. C.
Bureau of Education—
Knockdown model rural schoolhouses.
Bureau of Mines—
Models of life-saving apparatus.

INTERNATIONAL COMMITTEE OF YOUNG MEN'S CHRISTIAN ASSOCIATIONS, New York City.
Charts, photographs, and literature.

INTERNATIONAL HARVESTER CO., Chicago, Ill.
Photographs showing welfare work.

IOWA STATE COMMITTEE, Des Moines, Iowa.
Charts.
Bacteriological Laboratory—
Charts.
Iowa Dairy & Food Commission—
Photographs and charts.
Iowa Geological Survey—
Maps and charts.

JACKSONVILLE BOARD OF HEALTH, Jacksonville, Fla.
Charts.

JOHNS-MANVILLE CO., H. W., New York City.
Model refrigerator car and samples of manufactured material.

KANSAS STATE BOARD OF HEALTH, Topeka, Kans.
Pictures, charts, and model.

KANSAS STATE NORMAL SCHOOL, Emporia, Kans.
Pictures and charts and samples of water.

LANGSLOW, FOWLER CO., Rochester, N. Y.
Movable and adjustable school chairs.

LEITZ, ERNST, New York City.
Microscopic apparatus for medical research.

LEONARD & CO., W. C., Saranac Lake, N. Y.
Samples of clothing for outdoor living.

LOUISA M. ALCOTT CLUB, Boston, Mass.
Models and samples of work in teaching hygiene to children.

LYNCHBURG HEALTH DEPARTMENT, Lynchburg, Va.
Photographs, charts, and plans.

MARYLAND STATE COMMITTEE.
Baltimore Children's Playground Association—
Photographs and samples of work of the children.
Baltimore Health Department—
Bureau of Vital Statistics—
Charts.
Departments of Chemistry and Bacteriology—
Charts.
Baltimore Park Commission—
Photographs and water-color drawings.
Baltimore Public Athletic League—
Photographs, pennants, awards, et cetera.
Baltimore Public Bath Commission—
Model of portable bathhouse.

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MARYLAND STATE COMMITTEE—Continued.
Baltimore Sewerage Commission—
Photographs.
Baltimore Supervisors of City Charities—
Pin maps, models, and photographs.
Baltimore Water Board—
Photographs.
Sheppard & Enoch Pratt Hospital—
Photographs, models, relief map of the ground and buildings, and work of the patients.
State Department of Health—
Bureau of Bacteriology—
Photographs.
Bureau of Communicable Diseases—
Photographs, models, and cabinet.
Department of Sanitary Engineering—
Photographs.
Department of Vital Statistics—
Charts.
MASSACHUSETTS AGRICULTURAL COLLEGE, Amherst, Mass.
Photographs.
MASSACHUSETTS COMMISSION FOR THE BLIND, Boston, Mass.
Charts and photographs.
MASSACHUSETTS HOSPITAL FOR CONSUMPTIVES, TRUSTEES OF, Boston, Mass.
Photographs and statistics.
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, Boston, Mass.
Photographs and charts.
MASSACHUSETTS MILK CONSUMERS' ASSOCIATION, Boston, Mass.
Charts, map, and title piece.
MASSACHUSETTS SOCIETY FOR SEX EDUCATION, Boston, Mass.
Chart.
MASSACHUSETTS STATE BOARD OF CHARITY, Boston, Mass.
Statistics of pauperism, photographs of leper hospital.
MASSACHUSETTS STATE BOARD OF HEALTH, Boston, Mass.
Photographs and charts.
MASSACHUSETTS STATE BOARD OF INSANITY, Boston, Mass.
Charts.
MASSACHUSETTS STATE BUREAU OF STATISTICS, Boston, Mass.
Charts and exhibition case.
MASSACHUSETTS STATE CHILD LABOR COMMITTEE, Boston, Mass.
Photographs and charts.
MASSACHUSETTS STATE INSPECTOR OF HEALTH, DR. LYMAN A. JONES, North Adams, Mass.
Charts.
METROPOLITAN LIFE INSURANCE CO., New York City.
Model of building, photographs, statistics, and literature concerning welfare work.
METROPOLITAN PARK COMMISSION, Jamaica Plain, Mass.
Exhibition case and photographs of playgrounds.
METROPOLITAN SEWERAGE COMMISSION, New York City.
Photographs, plans, diagrams, and maps.
MICHIGAN STATE BOARD OF HEALTH, Lansing, Mich.
Charts showing statistics and wall cabinet.

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MILWAUKEE DUSTLESS BRUSH CO., Milwaukee, Wis.
Samples of brushes.

MINNESOTA SCHOOL FOR FEEBLEMINDED AND COLONY FOR EPILEPTICS, Faribault, Minn.
Charts and photographs.

MINNESOTA STATE BOARD OF HEALTH, St. Paul, Minn.
Charts and photographs.

Laboratory Division, Minneapolis, Minn.—
Portable apparatus for the hypochlorite disinfection of water.

MINNESOTA STATE SANATORIUM.

MONTANA STATE BOARD OF HEALTH, Helena, Mont.
Statistical cards, charts, and photographs.

MONTCLAIR BOARD OF HEALTH, Montclair, N. J.
Charts.

MULFORD CO., H. K., Philadelphia, Pa.
Transparencies and illuminated frames containing samples of vaccines, et cetera.

NATIONAL ASSOCIATION FOR STUDY AND PREVENTION OF TUBERCULOSIS, New York City.
Charts and photographs.

NATIONAL CASH REGISTER CO., Dayton, Ohio.
Charts, transparencies, and photographs illustrating factory hygiene.

NATIONAL CHILD LABOR COMMITTEE, New York City.
Charts, maps, samples, photographs, and posters.

NATIONAL CLOAK & SUIT CO., New York City.
Photographs showing welfare work.

NATIONAL COMMITTEE FOR MENTAL HYGIENE, New York City.
Charts, maps, models, specimens, bulletins.

Contributions by—
Committee on Mental Hygiene of New York State.
Charities Aid Association, New York City.
Connecticut Society for Mental Hygiene, New Haven, Conn.
Illinois Society for Mental Hygiene, Chicago, Ill.
Maryland State Board of Insanity, Baltimore, Md.
Massachusetts State Board of Insanity, Boston, Mass.
Minnesota School for Feebleminded, Faribault, Minn.
New Jersey State Hospital for the Insane, Trenton, N. J.

NATIONAL HIGHWAYS PROTECTIVE SOCIETY, New York City.
Charts and photograph.

NATIONAL LEAGUE BASEBALL CLUB, New York City.
Photographs.

NAVY, DEPARTMENT OF, Washington, D. C.
Model of U. S. S. *Arkansas*.

Bureau of Equipment—
Apparatus composing galley equipment.

Bureau of Medicine and Surgery—
Model of full-sized operating room, transportation apparatus for wounded on board ship, photographs, et cetera.

NELSON MANUFACTURING CO., N. O., Edwardsville, Ill.
Sanitary drinking fountain.

NEW YORK ASSOCIATION FOR THE BLIND, New York City.
Photographs and posters.

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NEW YORK ASSOCIATION FOR IMPROVING THE CONDITION OF THE POOR, New York City.
Photographs, posters, and models.
NEW YORK CENTRAL & HUDSON RIVER RAILROAD, New York City.
Photographs and models.
NEW YORK CITY.
Bronx, Borough of, Department of Parks—
Photographs.
Department of Education—
Apparatus for physical training (contributions by Narragansett Machine Co. and A. G. Spalding & Bros.), photographs, legends, records, badges, and literature.
Department of Health—
Models, charts, and photographs.
Division of Child Hygiene—
Photographs and charts.
Division of Communicable Diseases—
Models, photographs, charts, and literature in various languages.
Division of Vital Statistics—
Charts, models, and electric sign.
Department of Street Cleaning—
Photographs.
Department of Water Supply, Gas, and Electricity—
Laboratory Division—
Apparatus used in collecting, transporting, and examining samples of water.
Pitometer Division—
Models, charts, and diagrams.
Manhattan, Borough of, Department of Docks and Ferries—
Photographs.
Manhattan, Borough of, Department of Parks and Playgrounds—
Photographs.
Parks and Playgrounds Association—
Photographs.
Public School Athletic League—
Demonstration of folk dances.
Richmond, Borough of—
Photographs.
NEW YORK MILK COMMITTEE, New York City.
Statistics, charts, and photographs.
NEW YORK SILICATE BOOK SLATE CO., New York City.
Samples of manufactured articles.
NEW YORK STATE BOARD OF CHARITIES, Albany, N. Y.
Charts and photographs.
NEW YORK STATE DEPARTMENT OF AGRICULTURE, Albany, N. Y.
Samples of articles used in adulteration of food; charts and photographs.
NEW YORK STATE DEPARTMENT OF EDUCATION, Albany, N. Y.
Photographs showing hygienic school conditions.
NEW YORK STATE DEPARTMENT OF HEALTH, Albany, N. Y.
Division of Communicable Diseases—
Maps, charts, photographs, and illuminated maps.
Division of Laboratories—
Photographs.

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NEW YORK STATE DEPARTMENT OF HEALTH, Albany, N. Y.—Continued.
Division of Publicity—
Literature.
Division of Sanitary Engineering—
Charts, maps, plans, models, and illuminated maps and charts.
Division of Vital Statistics—
Charts and maps, illuminated charts and electric sign.
Oral Hygiene Division—
Charts, photographs, models, and literature.

NEW YORK STATE DEPARTMENT OF LABOR, Albany, N. Y.
Charts and photographs regarding factory conditions.

NEW YORK STATE HOSPITAL COMMISSION, Albany, N. Y.
Charts, photographs, models, handiwork of patients, and apparatus.

NEW YORK STATE INSTITUTE FOR THE STUDY OF MALIGNANT DISEASES, Buffalo, N. Y.
Photographs.

NIAGARA FALLS DEPARTMENT OF HEALTH, Niagara Falls, N. Y.
Charts and photographs showing municipal hygiene.

NORFOLK, CITY OF, VIRGINIA.
Charts.

NORTH CAROLINA STATE LABORATORY OF HYGIENE, Raleigh, N. C.
Charts and literature.

OPEN STAIR TENEMENT CO., New York City.
Plans and photographs.

ORAL HYGIENE COMMITTEE OF THE NATIONAL DENTAL ASSOCIATION and NATIONAL MOUTH HYGIENE ASSOCIATION, Cleveland, Ohio.
Contributions of models from the Army Medical Museum.
Fully equipped working model dentarium, transparencies, photographs, illuminating boxes with radiographs, microscopes, and slides.

PATRICK, DR. H. W., Elyria, Ohio.
Drinking fountain with apparatus for sterilizing cups.

PENN-AMERICAN PLATE GLASS CO., Pittsburgh, Pa.
Sanitary blackboard.

PENN HIGH SCHOOL, WILLIAM, Philadelphia, Pa.
Data concerning school lunches.

PENNSYLVANIA STATE COLLEGE, INSTITUTE OF ANIMAL NUTRITION, State College, Pa.
Charts, diagrams, photographs, and models of respiration calorimeter and carbon dioxide apparatus.

PEROLIN CO. OF AMERICA, Chicago, Ill.
Manufactured products for air purification.

PIERCE-ARROW MOTOR CAR CO., Buffalo, N. Y.
Photographs showing welfare work.

PLAYGROUND AND RECREATION ASSOCIATION OF AMERICA, New York City.
Charts, pictures, blue prints and drawings, and model playground.

PRINCETON UNIVERSITY, Princeton, N. J.
Department of Hygiene and Physical Education—
Photographs and charts; also map.

PRUDENTIAL INSURANCE CO. OF AMERICA, Newark, N. J.
Statistical charts showing mortality of occupations.

PSYCOPATHIC HOSPITAL, Brookline, Mass.
Charts and photographs.

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PUBLIC RECREATION COMMISSION, New York City.
Charts, legends, and pennants.

PULLMAN CO., THE, Chicago, Ill.
Photographs, charts, and models showing ventilation of sleeping cars.

RHODE ISLAND ANTITUBERCULOSIS ASSOCIATION, Providence, R. I.
Photographs and charts.

RHODE ISLAND STATE BOARD OF HEALTH, Providence, R. I.
Pictures, legends, and models.

ROCHESTER HEALTH BUREAU, Rochester, N. Y.
Charts.

ROCHESTER PUBLIC HEALTH ASSOCIATION, Rochester, N. Y.
Charts, photographs, and statistics.

ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH, New York City.
Photographs, placards, and pamphlets.

ROCKEFELLER SANITARY COMMISSION, Washington, D. C.
Data and specimens regarding hookworm disease.

SAGE FOUNDATION HOMES, New York City.
Photographs and plans.

SALUFORM PRODUCTS CO., Chicago, Ill.
Samples of manufactured products.

SARGENT, DR. DUDLEY A., Cambridge, Mass.
Photographs of types of athletes and anthropometrical charts.

SCIENTIFIC TEMPERANCE FEDERATION, Boston, Mass.
Charts, models, diagrams, and photographs showing alcoholic statistics.

SCOTT PAPER CO., Germantown, Pa.
Sanitary toilet articles.

SEATTLE DEPARTMENT OF HEALTH, Seattle, Wash.
Charts, photographs, relief maps, and models.

SMITH, DR. CLAUDE A., Atlanta, Ga.
Charts and photographs.

STEVENS INSTITUTE OF TECHNOLOGY, Hoboken, N. J.
Photographs.

STOELTING CO., C. H., Chicago, Ill.
Apparatus for measuring mentality.

STONE & FORSYTH, Boston, Mass.
Sanitary paper appliances.

STURTEVANT CO., B. F., Hyde Park, Boston, Mass.
Ventilating sets.

SYRACUSE DEPARTMENT OF EDUCATION, Syracuse, N. Y.
Photographs showing work in school hygiene.

SYRACUSE DEPARTMENT OF HEALTH, Syracuse, N. Y.
Charts, photographs, models, and maps.

TENEMENT HOUSE SUPERVISION OF THE STATE OF NEW JERSEY, BOARD OF, Newark, N. J.
Photographs and charts.

TERRITORIAL BOARD OF HEALTH, Honolulu, Hawaii.
Photographs and models.

TOLEDO BOARD OF EDUCATION, Toledo, Ohio.
Charts and photographs.

TREASURY, DEPARTMENT OF, Washington, D. C.
United States Public Health Service—
Fort Stanton, N. Mex.—
Charts, relief map, photographs, models, and handiwork of patients.

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TREASURY, DEPARTMENT OF, Washington, D. C.—Continued.
Washington, D. C.—
Charts, photographs, and models.
TUBERCULOSIS CLINICS, ASSOCIATION OF, New York City.
Model furnishings, charts, photographs, and literature.
TUBERCULOSIS COMMITTEE OF ITHACA, Ithaca, N. Y.
Photographs and charts.
UNITED SHOE MACHINERY CO., Boston, Mass.
Photographs showing welfare work.
UNIVERSITY OF ILLINOIS, STATE WATER SURVEY, Urbana, Ill.
Charts, maps, and samples of water.
UNIVERSITY OF PENNSYLVANIA, HENRY PHIPPS INSTITUTE, Philadelphia, Pa.
Specimens and charts.
UNIVERSITY OF WISCONSIN, Madison, Wis.
Charts.
VALPARAISO HIGH SCHOOL, Valparaiso, Ind.
Work of the pupils on oral hygiene.
VERMONT STATE COMMITTEE, Burlington, Vt.
Maps, charts, photographs, models, specimens, and literature.
VIRGINIA STATE DEPARTMENT OF HEALTH, Richmond, Va.
Charts and photographs, health bulletins.
WANAMAKER'S STORES, Philadelphia, Pa.
Photographs showing welfare work.
WAR DEPARTMENT, Washington, D. C.
Commissary Department—
Working field bakery.
Experimental Shoe Board—
Photographs, charts, and X-ray photographs; models.
Medical Department of the Army—
Field hospital.
Quartermaster Department—
Lay figures, tent models, clothing, bed with clothing.
WATERMAN-WATERBURY CO., Buffalo, N. Y.
Ventilating and heating apparatus; drinking fountain.
WHITE DENTAL MANUFACTURING CO., THE S. S., Philadelphia, Pa.
Dental outfits.
WISCONSIN ANTITUBERCULOSIS ASSOCIATION, Milwaukee, Wis.
Charts and photographs.
WISCONSIN STATE BOARD OF HEALTH, Madison, Wis.
Charts and statistics.
WOMEN'S MUNICIPAL LEAGUE, Boston, Mass.
Charts and material showing bad and good market conditions.
YALE UNIVERSITY GYMNASIUM, New Haven, Conn.
Charts and photographs; apparatus.
SANITATION CARS belonging to—
California State Board of Health.
Louisiana State Board of Health.
The Maryland Association for the Prevention and Relief of Tuberculosis.

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FINANCIAL STATEMENT OF THE EXHIBITION.

EXPENDITURES.

Administration:			
Salaries		$3,850.94	
Installation	$1,201.74		
Demounting	471.50		
Miscellaneous	183.48		
		1,856.72	
			$5,707.66
Building:			
Construction		21,047.72	
Installation	1,935.33		
Demounting	143.25		
Furniture and decorations	2,100.20		
		4,178.78	
			25,226.50
Total expenditure			30,934.16

RECEIPTS.

From contributors	900.00	
From exhibitors	2,216.39	
Salvage	1,455.00	
Total receipts		4,571.39
Net cost to committee of organization		26,362.77

In conclusion, the director of the exhibition desires to express his indebtedness first of all to the various State committees and exhibitors, who, by reason of their generous contributions of material and disinterested labors, brought about the success of the exhibition. Second, to the committee on organization and the executive committee of the Fifteenth International Congress on Hygiene and Demography, who by their unwavering support rendered the task of the director relatively easy of accomplishment. Third, to Mr. J. C. Boykin, of the Bureau of Education, who laid out the plans for installation of the exhibition and directed its installation. Credit for the favorable comments on the appearance of the exhibition is due entirely to Mr. Boykin's careful work of planning and supervision. Acknowledgments are due and are gratefully made also to the Nelite Works of the General Electric Co. and to the General Electric Co., who loaned the electric fixtures used in the building and the lamps for lighting, with the result that the illumination of the building at night was all that could be desired.

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ACTIVE MEMBERS (UNITED STATES).

ABBOT, Dr. E. Stanley, 592 Pleasant Street, Belmont, Mass.
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ALEXANDER, Dr. William G., 1604 Chicago Avenue, Evanston, Ill.
ALGER, Frederick M., Ford Building, Detroit, Mich.
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ALKIRE, Dr. J. P., Middleton, W. Va.
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ALLEN, Capt. Charles J., 9 Clinton Street, Newark, N. J.
ALLEN, Frederick B., 132 Marlborough Street, Boston, Mass.

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ALLEN, Dr. Gardner W., 419 Boylston Street, Boston, Mass.
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ALLEN, Kenneth, 17 Battery Place, New York.
ALLEN, Dr. M. May, 297 Alexander Street, Rochester, N. Y.
ALLEN, Dr. Samuel H., Vermont Building, Salt Lake City, Utah.
ALLERS, Dr. Henry, 300 Davis Avenue, Harrison, N. J.
ALLIS, Louis, 133 Stewart Street, Milwaukee, Wis.
ALLISON, Dr. Hendery, P. O. Box 198, Kingsville, Tex.
ALLPORT, Dr. Frank, 7 West Madison Street, Chicago, Ill.
ALLSTROM, Henry W., Northwestern National Life Insurance Co., Minneapolis, Minn.
AMBERG, Dr. Emil, 270 Woodward Avenue, Detroit, Mich.
AM ENDE, Dr. C. G., 319 West Forty-fifth Street, New York.
AMERICAN MUSEUM OF SAFETY AND INDUSTRIAL HYGIENE, 29 West Thirty-ninth Street, New York.
AMERICAN SANITARY PRODUCTS CO., 278 Brush Street, Detroit, Mich.
AMERICAN TELEPHONE & TELEGRAPH CO, Room 1305, 15 Dey Street, New York.
ANDERS, Dr. James M., 1605 Walnut Street, Philadelphia, Pa.
ANDERSON, Dr. G. R., Barnesboro, Pa.
ANDERSON, Dr. H. G., Waterbury, Conn.
ANDERSON, Dr. John B., 21026 Baldwin Avenue, Spokane, Wash.
ANDERSON, Dr. John F., United States Public Health Service, Hygienic Laboratory, Twenty-fifth and E Streets NW., Washington, D. C.
ANDERSON, Dr. J. Howard, Marytown, W. Va.
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ANGIER, F. J., Mount Royal Station, Baltimore, Md.
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ARCHER, W. M., Jr., First Lieutenant Medical Reserve Corps, Fort St. Philip, La.
ARMS, Dr. B. L., Oregon State Board of Health, Portland, Oreg.
ARMSTRONG, Dr. J. J. P., Box 3, Douglas, Ariz.
ARMSTRONG, Dr. Samuel T., Hillbourne Farms, Katonah, N. Y.
ARMY SERVICE SCHOOLS, Fort Leavenworth, Kans.
ARNDT, Dr. G. D., 7 South Gay Street, Mount Vernon, Ohio.
ARNOLD, Dr. E. H., 46 York Square, New Haven, Conn.
ARNOLD, Dr. John F., Limestone, Tenn.

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ARONSON, Dr. Moses, 1875 Madison Avenue, New York.
ARTHUR, Dr. Charles W., 56 Court Street, Plattsburgh, N. Y.
ASCHENBRENNER, Dr. Carl, Pella, Iowa.
ASHBURN, Maj. P. M., Medical Corps, United States Army, Manila, P. I.
ASHFORD, Dr. Bailey K., Major, Medical Corps, United States Army, San Juan, P. R.
ASHFORD, Dr. Francis A., United States Public Health Service, care James Yale, Immigration Inspector, Rouses Point, N. Y.
ASHLEY, Burton J., Morgan Park, Chicago, Ill.
ASPELL, Dr. John, 139 West Seventy-seventh Street, New York.
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AUSTIN, Surg. H. W., United States Public Health Service, United States Marine Hospital, Stapleton, Staten Island, N. Y.
AUSTIN, Louis W., 3136 Newark Street, Cleveland Park, Washington, D. C.
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AUSTIN, W. H., Y. M. C. A. Training School, Chicago, Ill.
AYER, A. W., 3403 Gray's Ferry Road, Philadelphia, Pa.
AYER, Mrs. Winslow B., 183 Nineteenth Street North, Portland, Oreg.
AYRES, Leonard P., 1 Madison Avenue, Room 400, New York.

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PLENARY ADDRESSES.

DUST AND FUME, FOES OF INDUSTRIAL LIFE.

Sir THOMAS OLIVER, M. A., M. D., LL. D., D. Sc., F. R. C. P., professor of practice of medicine, University of Durham College of Medicine, and physician to the Royal Victoria Infirmary, Newcastle-upon-Tyne.

Diseases of occupation are the outcome of civilization. They owe their origin to the rise of chemistry, the invention of machinery, the massing of the people, and the rise of modern towns. Factory life is of comparatively recent date. In ancient civilization nothing existed exactly comparable with the modern factory system. In those days slaves did the work hired labor now accomplishes. Industry has passed through various developmental stages—the purely muscular, when work was the product of personal physical effort; the age of the water mill, and the introduction of machinery; then came steam, while the last to dawn is the age of electricity, for the generation of which the aid of water power has again been invoked. Interesting as it would be to consider how, under each of these particular methods of production, the industries of successive periods acted and reacted upon the society of the respective epochs, the subject hardly comes within the scope of this address. Notwithstanding the outcry against machinery and its deteriorating influence upon the workpeople, the use of steam and electricity has transformed the world. It has cheapened production, increased employment, while, by breaking down international barriers, it has brought peoples of different tongues together, has widened the outlook of humanity, and added to the sum of wealth and happiness.

To-day we shall consider some of the industrial conditions under which wealth is produced, but especially those which are prejudicial to health. To many of us the call to work is one of those agreeable sensations which affirms the value of life, but, alas, to countless thousands of men and women it brings but gloom and a sense of hardship; for labor shorn of dignity is no longer a joy to man, but a cause of discontent with himself and his fellow men. Apart from mechanical injuries, two of the principal dangers of modern industrial life are dust and fume. Little was thought of the relation of disease and employment until statistics came to be collected. Since then factory legislation has striven to regulate hours of work, to improve conditions of labor, and to minimize the harmful influences of dust and fume.

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Unrest in the modern labor world, and the demands by the workpeople for a larger share of the wealth they are helping to create, have for the moment thrust into the background industrial hygiene and its importance. Men and women, crippled through following a particular occupation, become not only a financial burden upon industry, but a drag upon social communities as well. Whatever may be the object of life, our ambition, as well as our duty, should be to see that, apart from unavoidable accidents, each trade is rendered free from danger, so that in following it no risk is incurred. Society, admitting the debt it owes to workmen for the risks they undertake, accepts without much demur workmen's compensations, national insurance, and increased cost of purchase as means whereby compensation may be given to men and women who have gone down under the strain of production. Nor is this demand upon society unreasonable, when the toll of human life paid to industrial enterprise is considered. Prof. Allan Starr, of Columbia University, affirms that in the United States in 1910 there were 3,500 deaths from industrial accidents alone. Mr. Walter L. Fisher, of the Department of the Interior, reports that in the United States during the past 10 years 30,000 men have been killed and about 60,000 injured in mining. It is disconcerting to know that many of the deaths and accidents could have been prevented. If we assume that of the 33,600,000 males and females engaged in industry in the United States 40 per cent, or about 13,400,000 persons, are invalided every year, and that the average cost of the illness due to occupation amounts to $772,892,860, or about £150,000,000, it is an enormous loss viewed from the financial side alone.

In the rise of modern industries two things at least strike us: (1) The effect of occupation upon those employed, and (2) the influence of industries upon localities and upon persons dwelling therein, for the multiplication of industries can not but have in some instances an unfavorable effect upon people born and reared in the shadow of factory chimneys. Comparing the death rates of agricultural and industrial districts, country data stand out favorably as against those of towns. The extent to which mortality rates vary in industrial centers has been studied by Dr. Louis Ascher, of Königsberg,[1] whose contention, speaking for his own country, is that as Germany has become more industrial, her death rate, especially from acute pulmonary disease, has risen, and for this the increasing volumes of smoke thrown into the atmosphere are largely responsible. The mortality curves for tuberculous and nontuberculous diseases are highest in the large towns. They bear a distinct relationship to the size of the town, the density of the population, and the social well-being of the people. In the industrial districts of Germany the mortality from nontuberculous diseases has increased, especially in children and old

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people. In 1882 Finkelburg showed the existence of a high tuberculous mortality rate in textile districts and a high nontuberculous rate in smoky industrial centers. He found that the death rate from acute inflammatory diseases of bronchi and from catarrhal affections of the lungs was highest where much coal was burned, in contrast with the mortality from pulmonary tubercululosis, which was highest in textile towns. Between 1875 and 1879 the mortality in Prussia from acute lung diseases was 18 per 1,000; from 1900 to 1904 it was 27 per 1,000, or an increase of 70 per cent in 25 years, while during the same period the death rate from tuberculosis fell from 31 to 19 per 1,000, a reduction of 36 per cent. The higher mortality from nontuberculous diseases was observed chiefly among elderly people and young children and occurred mostly in the smoky industrial centers of Rhineland and Silesia. It is common experience that the course of pulmonary tuberculosis is hastened by living in a smoky atmosphere, also that smoke predisposes to acute lung disease. Soot differs from coal dust in being a spongy material capable of absorbing sulphuric and hydrochloric acid up to 10 per cent, besides retaining other free acid gases and certain oxidation products of a tar-like nature. From a respiratory point of view damp soot is worse than dry soot, hence the harmful effect of fogs. Apart from the loss of sunshine which the presence of soot in the air of a large city entails, the retained acids, especially sulphuric, are harmful alike to buildings, vegetation, and man. Professor Rubner, who has given considerable attention to the study of fogs and the harmful effects of smoky atmospheres upon plant life, whereby certain trees are disappearing from large towns, is of the opinion that the human lung can not be exposed to smoke without undergoing some structural alteration. Like Ascher, he maintains that in Germany a smoky atmosphere is responsible for the increased mortality from lung disease other than tuberculosis. According to Lehmann, while the sulphur dioxide contained in soot is absorbed by the nasal mucous membrane, the particles of carbon are carried further into the respiratory passages. Finally reaching the lungs, the particles of soot are deposited there, having meanwhile in their descent given up to the bronchial mucous membrane and the lining membrane of the lungs some of the acids they retained.

The increase of nontuberculous lung diseases is not confined to Prussia alone. It may be taking place, for all we know, in other countries where manufactures are increasing rapidly. The mortality from nontuberculous diseases in the towns is almost double what it is in the country. In towns where much coal is burned, there is a higher percentage of nontuberculous to tuberculous disease—the proportions being in industrial smoky towns 130 to 100 per 100,000 inhabitants, in textile towns 47 to 40, and in country districts 14

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to 11. Ascher supplies an illustration: The small, smoky town of Waldenburg is 10 miles from the textile town of Wusterwaltersdorf. In comparing the two towns per 1,000 living in 1900, 1901, and 1904, he found the mortality rates to be: In the textile town, 1.83 tuberculosis, 2.23 nontuberculosis; in the smoky town, 1.77 tuberculosis and 2.93 nontuberculosis.

That is an increase of 30 per cent of nontuberculous mortality in the smoky district, only 10 miles away. It would seem, therefore, that where smoke is produced in greater abundance, there is also found a higher mortality from acute lung disease. Smoke encourages fog, and fog is destructive to life. In Glasgow during a November fog the death rate from acute respiratory diseases, including pneumonia, was 13.9, but in the other towns of Scotland it was only 3.3. Many uncomplicated cases of pulmonary tuberculosis are within the range of cure. It is infection by other organisms which frequently transforms a possibly curable into an incurable case. A smoke-polluted atmosphere predisposes to acute lung diseases and hastens the course of tuberculosis. Experiments carried out by Ascher, Von Baumgarten, and Hildebrandt throw light upon this subject. Ten rabbits received a hypodermic injection of *perlsucht* and were placed in a smoky atmosphere; nine rabbits similarly inoculated were placed in a nonsmoky hutch; other nine animals which had not been inoculated were placed in a smoky hutch as a control experiment. All the animals, similarly cared for, were placed in their hutches on November 11. By February 26 all the *perlsucht* animals which had breathed the smoky atmosphere were dead. In the hutch with no smoke, four of the inoculated animals were still alive and lived for 24 days longer. In another set of experiments the animals exposed to smoke lived 53.9 days, and those not exposed to smoke lived 90.3 days. According to Ascher, in the smoky districts of Germany there is taking place not only an increased number of cases of acute inflammation of the lungs, but persons who are the subjects of pulmonary tuberculosis die in these smoke-laden districts more rapidly than those persons similarly affected, but living elsewhere. I can not say that in the smoky towns of Great Britain there has been such an increase in the mortality rates from respiratory diseases as has taken place in Germany. Only in 4 smoky towns out of 19 have I found a rise in the mortality from this cause during the last 10 years, also a rise in 1 textile town out of 7. The death rate from pneumonia has risen in six smoky towns, but only in one textile town, while the mortality from pulmonary tuberculosis has risen in two of the smoky and in one of the textile towns.

With a view of preventing fog and of clearing the atmosphere polluted by smoke from burning coal, greater use of gas fires has been recommended. In trying to obviate one source of discomfort

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and risk to health, care must be taken that other dangers are not incurred. Judging from the odor appreciable on entering a house wherein gas fires are burning, there must always be more or less an escape of unconsumed gas. Upon women and children working and living in such a house, and inhaling all day long during the winter months small quantities of carbon monoxide gas, are we quite sure that the ultimate effects produced thereby would not be just as bad as, if not worse than, those caused by fog or a smoky atmosphere?

DUST ON ROADS AND STREETS.

Human endeavor is a strange blending of contraries. Public health is doing its utmost to promote longevity; industrial development, although making for the well-being of a nation, brings disease in its train, while at the same time it supplies the means whereby disease may be averted through improving the conditions of life. The motor car, in bringing pleasure to a few, is yet robbing all of many of the beauties of nature, while socially it is widening the gulf which separates the poor from the rich. Road dust, by disturbing the chlorophyll function of leaves, is destructive to vegetable life. The fine dust of roads blown upon the leaves blocks their stomata, unless washed away by rain or carried off by the wind. When roads have been tarred, the adjoining trees suffer, especially in a hot summer, for adhering to the leaves the particles of tar melt under the influence of the high temperature, and, flowing into the stomata, blockage takes place, and the foliage dies from asphyxia. Some of the harmful effects are doubtless the result of the chemical, as apart from the physical, action of dust, for dust gathered from trees five days after a road had been tarred gave a strong phenol reaction, which was still present 15 days afterwards.[2] In the Bois de Boulogne, where portions only of the avenues exposed to the sun were tarred, vegetation was found to be stunted and the leaves shorter and smaller than those of the trees outside the poisonous zone. Not only did the leaflets fall prematurely, but the annual shoots were less vigorous and their leaves smaller. Where plants are exposed to road dust, the leaves become brown, decay early, fall off prematurely, and, in each succeeding springtime, the shoots become feebler and feebler. While the lower branches of trees are thus injured by road dust, the higher branches suffer from the smoke and chemically laden atmosphere of large manufacturing towns. In England even sport is menaced by the dust from tar macadamized roads polluting the rivers. Complaints are loud that in many of the best fishing streams the trout are dying in consequence of becoming poisoned by road dust. Bird life, too, is becoming scarcer. Owing to the dust deposits on the roadsides interfering with the growth of vegetation, there are fewer insects, and, as a consequence of fewer insects, there are fewer birds.

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The goldfinch has, practically speaking, disappeared from Great Britain, and others of our feathered songsters are becoming equally rare.

The harmful effects of road dust are surpassed by those of the dust of the streets of our large towns. Mr. Frederick L. Hoffman, statistician of the Prudential Assurance Society of America, has drawn attention to this subject. Street sweepers are not a healthy class of men. American statistics show that tuberculosis is extremely prevalent among them, and that about one-third of the 5,000 persons employed in cleaning the streets of New York were a few years ago infected with tubercle, notwithstanding the fact that the men before being employed were examined by physicians. The men employed in the east end of the city, where the streets are dirtier, and where many of the inhabitants are the subjects of nasal, pharyngeal, and pulmonary catarrh, suffer more than the sweepers of the west end of New York. In 1907, the year Mr. Hoffmann[8] wrote his paper, the dust of New York was collected without the streets being sprinkled with water; but fresh methods have since been introduced, whereby the dust is now removed under cover, and as a consequence the health of the men has improved. The experience of the Prudential Assurance Co. of America for 1897–1905 deals with 145 deaths of street cleaners from all causes. Of these, 20 per cent of the deaths were due to pulmonary tuberculosis and 18 per cent to respiratory diseases. The mortality from consumption was 50 per cent between the ages of 25 and 34, 33 per cent between the ages of 35 and 44, and 13.3 per cent between 45 and 54. There is, or was at that time, in New York, a considerable amount of pulmonary consumption among street cleaners, due, no doubt, to the men inhaling dust impregnated with tubercle bacilli. It is only right to remind this audience that while Cornet failed to find tubercle bacilli in dust taken from the streets, Dr. Robertson, M. O. H. Birmingham, found the bacilli on a few occasions in dried expectorations taken from the streets of Birmingham. Dr. Fritz Kristen, of Breslau, carried out a series of experiments to determine the length of time tubercle bacilli remain alive in dust capable of floating in the air. Tubercle bacilli are short lived when exposed to daylight and to sunlight. In street dust infected with tubercle bacilli, the microorganisms lived from 3 to 8 days; on cloth, 5 to 10 days, while in pulverized expectoration they lived 4 to 7 days.

SUBWAYS AND RAILWAY TUBES.

Not less important from the point of view of health is the dust of subways and the railway tubes of large cities. Apart from excess of CO_2, Dr. Soper, of New York, has shown that the dust of railway

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tubes contains 61.3 per cent of iron, mostly in the metallic form, that the organic matter, which amounts to 21.9 per cent, is mostly of animal and vegetable origin, and that 15.6 per cent is composed of silicate and 1.3 per cent of oily material. The air of the subways contains myriads of bacteria, most of them harmless. On microscopical examination the greater part of the dust was found to be composed of fine platelets of iron, inhalation of which, and of the dust generally, is regarded by Dr. Soper as likely to harmfully affect the workmen, who are obliged to be in the tunnels several hours daily, and to induce within their lungs structural changes which eventually lead to fibroid phthisis.

Dust, smoke, and fume are the products of industrial activity to be feared. In what relation do these stand to each other? Dust is usually regarded as matter in a state of fine division, but modern research shows that dust, from a medical point of view, is something more than this. Smoke and fume differ from dust in being the products of heat, and these two again differ from each other in this respect, that smoke is the outcome of incomplete combustion of hydrocarbons, such as coal, wood and oil, while fume is firstly the gaseous form of metals, nonmetals, and their compounds, and, secondly, the return of these from the gaseous to the solid state, as seen in the flue deposit of a lead smelting factory. Soot, on the other hand, is a hydrocarbon, which has not completely combined with oxygen to form gases.

Although we are more immediately concerned with the effects of dust upon the lungs, yet the whole body, including the skin, mucous membranes and the internal organs, suffers in due course by exposure to dust. We seldom think of the part which dust and smoke have played indirectly in shaping the social habits of a people. How to get rid of dust and fume in the factory, of smoke in the atmosphere, and of the incidence of all of these upon the skin and the respiratory organs of man has formed not only the subject of many a scientific discussion, but has stimulated enterprise and encouraged manufacture. In trying to combat their begriming effects we have become a well-washed people. The dispersion of these waste products has led to the manufacture and use of soap in proportions hitherto unparalleled in the history of man, while these again have indirectly added to employment, wealth, and health. Frequent ablution has become the rule, so that baths, a luxury to the Romans in the palmy days of Empire, and unknown in even large houses in my own country four or five decades ago, are now a necessity, for they find a place in many of the modern houses of the working classes. Dust and fume, begriming agents as they are, have therefore done something to socialize mankind, to promote public health, and to advance civilization, for

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those nations are leading in the path of progress to-day whose workers not only require soap and water for themselves, but who, by the factory dust and smoke they create, oblige all of us to resort to similar usages.

It is probably expected of me that in this address I should say something of plumbism and dust, but as lead poisoning is to be discussed in one of the sections, I shall not deal with this subject here other than briefly refer to the fact that inhalation of lead and other poisons in the form of dust is sooner or later followed by intoxication, frequently of a severe type, owing to the double channel of entrance by the lungs and alimentary canal. As bearing upon industrial poisoning in general, Lehmann, of the Würzburg Institute of Hygiene, has raised an interesting point. He maintains that the fine particles of dust floating in the air of a factory are surrounded by moisture, or, in other words, are embedded in minute droplets of water, so that when they reach the lung by inhalation, they are completely absorbed if they are soluble in a medium of such faint acidity as CO_2. In factories or workshops a moist atmosphere by its watery vapor condensing upon particles of dust, would thus, as in the case of fogs, be more harmful than a dry atmosphere. Dust is something more than what we at first imagine. While the dust generated in factories and workshops may do physical injury to those inhaling it, owing to the circumstance of its being in a state of fine division, it is in addition, from the layer of moisture which surrounds it, the vehicle for conveying into the system microorganisms, also the products of fatigue and respiratory waste given off by the workpeople. These products cling to dust and impart to it their own peculiarly depressing and poisonous qualities.

In a general address like this, it is impossible to deal with all the aspects of the dust problem. It is the fine impalpable dust which does harm. Although dust is heavier than atmospheric air, it can yet remain suspended in the air of a workroom or factory contrary to the influence of gravity, owing either to the gaseous envelope which surrounds the individual particles of dust, to currents created by the running of machinery, or to electric conditions of the dust itself. The simple friction of dust by our feet in walking may confer upon the dust electrical conditions the bearing of which is too complicated to be worked out in detail. The subject of electrified dust is beyond the scope of the present address.

COAL DUST AND ITS DANGERS.

The amount of coal raised is to some extent a measure of a country's prosperity. Of the 1,500,000 men employed in mining in the United States, nearly one-half, or about 725,000, work in coal mines.

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As showing the growth of the coal industry in the principal coal producing countries, there were employed in Great Britain in 1900, 766,900 coal miners; in 1910 the number rose to 1,042,400; the tonnage of coal raised in 1900 was 252,000,000 and in 1910, 296,000,000. In the United States the numbers for the same years were: 486,600 and 725,000 miners, and the tonnage 360,000,000 and 502,000,000. Prussia during the same period had 419,000 and 635,000 miners, and a tonnage of 150,000,000 and 221,000,000. In France the number of coal miners in 1900 was 178,894 and in 1909, 225,184; the tonnage raised for these years was 31,639,737 and 37,840,085. Belgian statistics for the same years gave 132,749 and 145,277 miners, and 23,462,870 and 23,517,550 tons of coal raised.

There are few industries in which legislation has been so effective in saving life as in coal mining, and yet much remains to be done. A little over half a century ago the mortality of coal miners from lung disease was extremely high. Double shafts for the intake and uptake air and through ventilation have so improved the health of coal miners that their occupation is now regarded as a comparatively healthy one. It is possible, however, that the excessive ventilation at present in vogue is creating fresh dangers by stirring up fine dust, and that dangers therefore are being created more immediately destructive to life than those caused by the less perfect ventilation of half a century ago. In the onward rush of air through the workings of a mine, the finest particles of dust are borne to the roof and sides and are there deposited in the crevices of the rock, upon the bars, and props of wood. Now and again the civilized world is shocked by the news of an explosion, such as that which occurred at the Courrières mines in 1907, whereby 1,100 men and boys lost their lives. Years ago explosions in coal mines were usually regarded as the result of the ignition of fire damp, but it is becoming more generally admitted that dust is the main cause, and that this can be fired without the intervention of gas. The fine particles of coal dust are readily disturbed by a strong blast of air and are raised into a cloud becoming an intimate mixture of carbon and oxygen. The carbon and hydrocarbon particles of coal dust are not only surrounded by the oxygen of the air, but are permeated also by it, so that these are all intimately mixed when a shock is given to the air. The amount of oxygen absorbed by coal dust increases with the barometric pressure, hence the necessity of attention to "coal warnings." In its power to absorb oxygen, and in the chemical processes induced in the coal thereby, lies one explanation of the fires which spontaneously break out in coal mines. Whatever the cause, be it electric shock, a blown-out shot, or a naked light igniting gas, when an explosion occurs in a mine there is a perfect hurricane of air set

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in motion which is projected upon the dust in the roadways. It is not the coal dust which explodes, but the mixture of air, dust, and volatile matter. In Taffanel's experiments at Liévin, explosions occurred on firing cartridges when the air contained in suspension 112 grammes of coal dust per cubic meter (3 ounces of dust per cubic yard) of air space. It requires two months of ordinary working in a mine for a sufficient amount of dust to accumulate to exceed the limits of safety. One three-hundredth part of an inch of coal dust lying in the roadway is a source of danger, and less than one-third of an ounce of coal dust per cubic foot of air will continue to propagate an explosion. Unless the initial explosion is violent enough to cause a blast of air to move forward more rapidly than the flame travels, an explosion can not be propagated. This blast of air, or "pioneering cloud," keeps well in advance of the flame, ever raising the dust into a cloud and making it behave like tinder, so that the volume of ignition becoming enlarged, the explosion fills the roadway from floor to roof. Under favorable conditions, once an explosion is started, nothing can arrest its onward course. Separation doors are blown out, timber props smashed, roofs are brought down, and the bodies of coal miners are hurled a distance and dashed against the rock. The air displaced by the expansion is replaced by suction, but in the affected roadways a mixture of air remains which, although holding enough oxygen to keep lights burning, is yet poisonous to life, owing to the carbon monoxide it contains. The death of coal miners after an explosion is not alone the result of the explosion having acted mechanically, nor of the burning caused by the flame, but is also the result of the deadly influence of the "after damp" or carbon monoxide. To carbon monoxide poisoning probably 80 per cent of the deaths in a mine explosion are due.

In my own neighborhood the subject of colliery explosions has for a long time engaged the thoughtful attention of mine owners and managers, and within recent years it has received special consideration and experimental investigation at the hands of Profs. Bedson and Thornton and of Mr. Hermann Belger, all of the Armstrong College, Newcastle-upon-Tyne. Both Bedson and Thornton have made experiments to show the danger of coal dust, and the readiness with which it can be ignited by naked lights, heated platinum wires, and electric flashes. While most forms of coal dust on becoming ignited explode, other forms such as anthracite behave like charcoal—the burning is local and does not spread. Such fine dust as flour, sugar, sawdust, and lycopodium, also solid metals like magnesium and aluminum in a state of fine division, burn with explosive violence. During the firing of coal dust volatile and combustible substances are produced; these, mingling with the air, form mixtures, through which burning is translated with explosive violence.

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Absorption of oxygen leads to the spontaneous combustion of coal. From the inquiry of a royal commission the following (Figure I) has been extracted to show the number of coal carrying ships in which spontaneous combustion occurred in one year. Belger carried out a series of experiments bearing upon the increase in weight of coal exposed to the air. These experiments were undertaken without any reference to the transport of coal in ships or to the accidents occurring therein. We have reproduced in Figure IV the two facts, not because they are related to or associated with each other, for this is impossible, seeing that the dates are different, but because of their close association with particular seasons of the year. In the warmer

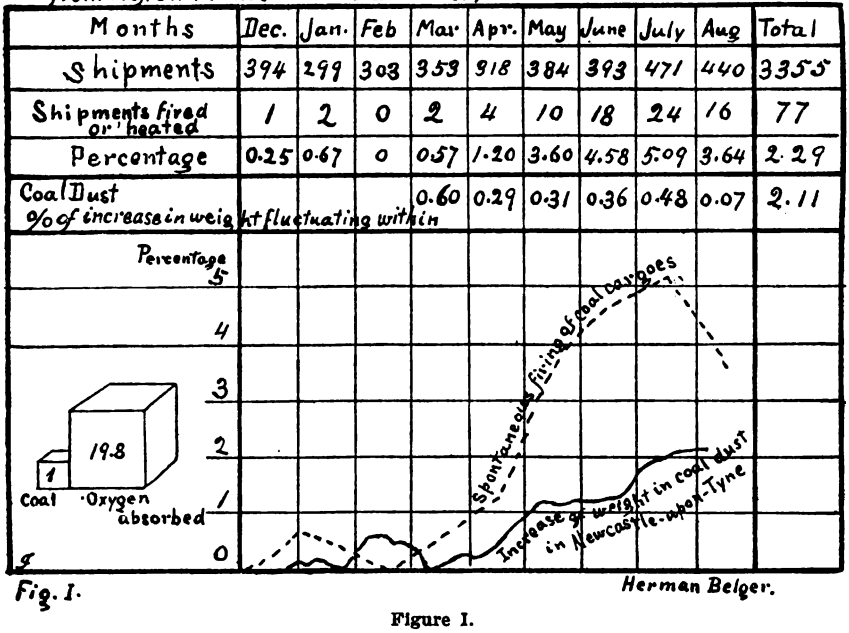
from Prof. Sir Thomas Oliver's Laboratory.
Months | Dec. | Jan. | Feb | Mar. | Apr. | May | June | July | Aug | Total
Shipments | 394 | 299 | 303 | 353 | 918 | 384 | 393 | 471 | 440 | 3355
Shipments fired or heated | 1 | 2 | 0 | 2 | 4 | 10 | 18 | 24 | 16 | 77
Percentage | 0.25 | 0.67 | 0 | 0.57 | 1.20 | 3.60 | 4.58 | 5.09 | 3.64 | 2.29
Coal Dust % of increase in weight fluctuating within | | | | 0.60 | 0.29 | 0.31 | 0.36 | 0.48 | 0.07 | 2.11
Percentage
5
4
3
2
1
0
19.8
1
Coal
Oxygen absorbed
Spontaneous firing of coal cargoes
Increase of weight in coal dust in Newcastle-upon-Tyne
Fig. I.
Herman Belger.

Figure I.

months of summer, when a more rapid absorption of oxygen by coal is taking place on land, a similar event is apparently happening in the holds of ships.

If evidence of a similar nature were required to show the relationship of mine explosions to the warm months of the year, the undermentioned explosions which occurred in the Abercarne mine in Wales are not without interest:

October 2, 1872, 1 man killed; July 24, 1876, 3 men killed; September 11, 1878, 268 men killed, after which the pit was closed; but on July 15, 1880, there occurred in the New Risca mine, adjoining the Abercarne, and sunk to replace it, an explosion which caused the death of 120 men. All through the dry months of summer, coal in

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a mine is silently absorbing oxygen, when perhaps there occurs a thunderstorm attended by a sudden fall of barometric pressure, and as a consequence gases in the coal are liberated, and the lives of men working underground are endangered.

PREVENTION OF EXPLOSIONS IN COAL MINES.

Since ignition of gas and firing of fine coal dust are the causes of explosions in coal mines, a daily inspection of the working places in mines for fire damp and attention to the accumulation of dust are clearly the preventives called for. Fire damp ignites more readily than coal dust. Experience shows how difficult it is to prevent accumulation of dust to a dangerous extent, how all but impossible it is to remove it, and how impracticable it is to water the dust. The removal of dust by vacuum cleaners has been recommended, but has received little support. W. E. Garforth, of Altofts Colliery, recommends as the outcome of his experiments (1) water spraying of the dust under high pressure; (2) keeping the roadways free from dust for certain lengths, thereby creating dustless zones; (3) covering or diluting the coal dust with stone dust. Whatever is the preventive used care must be taken that it does not make matters worse by substituting fresh dangers for those removed; that the health of the miner is not prejudiced thereby; that the coal is not spoiled nor the plant of the mine injured. Water spraying suggests itself as a ready means of laying dust, but water and fine coal dust do not readily mix with each other. Watering of the floors is not sufficiently protective, since the fine dust accumulates on the sides and the roof of the roadways. Coal dust not only floats in water, but is disintegrated by it, as Belger's experiments carried out in my laboratory show.

Water causes the particles of coal to break up and to become finer, and in this way the danger is increased when the dust again becomes dry. If iron pyrites is present in the coal, water spraying favors explosion, since under the influence of moisture and air, assisted by the temperature of the mine, pyrites undergoes decomposition. The heat generated by the incidental chemical changes reacts upon the rock and coal, and by thus raising the temperature it allows of the lighter hydrocarbons being set free and of thereby paving the way for spontaneous ignition. Water also rots timber and corrodes iron. A few years ago Westphalian mine owners awoke quite unexpectedly to a knowledge of the harmful results of water spraying in coal mines. Owing to explosions having taken place in the dry and dusty mines in the Valley of the Ruhr, it was a recommendation of the German Government of 1900 that water spraying should be adopted. This was done, with the result that mines which had

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hitherto been free from ankylostomiasis afterwards became veritable hotbeds of the disease. The ova of ankylostoma, owing to lack of moisture, had not been able hitherto to proceed to the larval stage, but water spraying, by supplying the necessary moisture, favored their development, so that the collieries became infected by the pest known as the miner's worm. The following figures show how by trying to obviate one danger other risks not less serious had been incurred. The number of cases of ankylostomiasis in the Valley of the Ruhr was: In 1896, 107 cases; 1897, 113 cases; 1898, 99 cases; 1900, 270 cases; 1901, 1,030 cases; 1902, 1,355 cases.

It was in 1900 that water spraying was begun. The enormous increase in the number of cases of ankylostomiasis after water spraying is more than a coincidence. To water spraying another objection may be raised. Men work with less fatigue in a dry atmosphere. Where the temperature of a coal mine is 25° C. (77° F.) and upward, the addition of moisture to the air of the mine only makes the work more trying to the men.

Since, therefore, water spraying is impracticable in certain mines, can any other means be adopted whereby, by causing particles of coal dust to become agglutinated or enveloped in a capsule of noninflammable material, the firing of coal dust may be rendered impossible? Prof. W. M. Thornton recommends spraying dusty mines with soapy water. Others think to have found in calcium and magnesium chlorides, in silicate of soda, glycerine, et cetera, suitable agents which would cause dustiness to disappear from mines. But none of these alone mixes well with coal dust any more than does water, though most of them have the advantage of absorbing and retaining moisture for a considerable length of time. Nothing must be added to the dust likely to irritate the lungs of the miners. In Hermann Belger's mode of treating coal dust advantage is taken of the above whereby the mechanical and chemical methods are combined. No chemical compound is formed between the coal dust and the materials employed; the association is purely mechanical, but it is of such a nature as to prevent chemical action occurring in the rock, the coal itself, wood and iron. Coal dust is not only matter in a state of fine division, but particles of matter, each with a little atmosphere of its own. In the experiments carried out in my own laboratory and in a coal mine, Belger has sought not only to convert fine impalpable dust into larger particles, which by becoming agglutinated and retaining moisture do not, owing to their chemical constitution, readily rise into the air, but are of such a nature that, while they prevent the propagation of an explosion, the materials used are at the same time harmless to the miners. Coal is a peculiar product; it keeps absorbing oxygen from the air in preference to CO_2; if it has absorbed CO_2.

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it will part with it in preference for oxygen in the presence of hydrogen contained in the coal. Belger's method of treating dust consists in the adoption of means for removing the oxygen and carbon dioxide from the coal by inexpensive chemical agents, thereby preventing any further absorption of gases, and of keeping the dust moist through the medium of chemical means, thus converting the whole into colloid material, rendering it uninflammable, and at the same time receptive for newly formed dust. By this means the whole mine can be kept free from dust by renewed application of the treatment every 4 to 10 weeks.

Garforth maintains that when stone dust and coal dust are present in equal proportions, flame is not propagated, so that by strewing a mine with stone dust an effective remedy is provided against explosion. He found that the application of stone dust over eight miles of roadway in Altofts Colliery caused no inconvenience or discomfort to the men. Zones of stone dust check flame. Dustless zones, on the other hand, can not be maintained; for when an explosion occurs, the initial dust cloud carries forward fine coal dust in advance of the flame, whereas, in a zone strewn with stone dust, the flame is extinguished after 22 to 59 feet. A layer of stone dust $\frac{1}{2}$ of an inch in thickness is sufficient to check the progress of an explosion; it extinguishes flame and reduces temperature.

Taffanel, the director of the experimental gallery at Liévin, speaks also favorably of the influence of stone dust. He found that if between the place of origin of an explosion and other parts of a mine, there exists a zone in which the air contains in suspension plenty of stone dust (90 per cent), an explosion is not propagated. He places close under the roof of the roadways planks covered with 10 centimeters of fine slate or stone dust. An explosive wave passing along the gallery overturns the planks and disseminates the stone dust, immediately forming a neutral zone, through which the explosion can not proceed.

Since explosions in coal mines depend upon the admixture of coal dust and air, especially oxygen, it has been suggested that, if the supply of air to coal mines was diminished, the respiratory activity of the men working in the mines would not be interfered with, while the possibility of explosions would be lessened.[4] In addition to the suggestion of the supply of oxygen being diminished, it has been proposed that a small proportion of CO_2 should be added to the atmosphere in mines. Although candles and safety lamps are extinguished, when the percentage of oxygen falls to 17 per cent, yet air with this proportion of oxygen is satisfactory enough from a respiratory point of view. Admitting these facts, it would be difficult, by the methods of ventilation at present in use, to maintain this required percentage. But apart from this, consider for a moment where the men are

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working. It is at the face, that is, in blind recesses, and at the terminal ends of cuttings through which no current of air is passing, and from which the used up air is with difficulty removed. To diminish further any possible chance of atmospheric air and oxygen reaching these places, would be only to make matters worse for men working in air already fouled by the natural gases from the rock, by the combustion products of the lamps, and the exhaled respiratory waste of the human body. While, as already stated, excessive ventilation of coal mines can become a source of danger, yet, were means adopted to restrict the air supply to men working in coal mines, there is no evidence to show that the smaller percentage of oxygen could be evenly maintained, and with coal continually absorbing oxygen, the occurrence of any hitch in the machinery supplying the air might cause hundreds of lives to be lost in a comparatively short time.

Can anything in addition to the foregoing be offered? Having determined that coal increases in weight on exposure to air, we carried out a series of experiments to ascertain the amount of gas capable of being absorbed by coal under varying circumstances. Samples of coal dust placed in retorts were exposed to daylight, kept in darkness, exposed to the influence of Roentgen rays, and kept in daylight or in darkness, exposed to the influence of radium, moistened with water, and so forth.

Figure II. In this experiment the greatest absorption of gas by coal dust took place under the influence of Roentgen radium in the dark. By the sixth day coal, in the dark or in daylight, had absorbed upward of 9 cubic centimeters of gas. Treated by Belger's fluid absorption was, practically speaking, nil—there being little difference between the curves of absorption and those of barometric pressure.

Figure III. Coal in the dark absorbed the greatest amount of gas, viz, 13 cubic centimeters. This is 30 per cent higher than the amount absorbed by coal exposed to daylight. In this experiment Roentgen rays operated upon coal, kept in the dark or exposed to daylight, but there did not occur any of the inhibition of absorption noticed in the previous experiment. With Belger's fluid no absorption of gas took place. In a general way it may be said that there is a concurrence between absorption of gas and the rises and falls of barometric pressure, but on careful perusal of the chart it will be seen that the absorption of gas by coal is something more than a question of barometric pressure.

Figure IV. Coal dust in the wet and dry state. While in the early stages of this experiment water seemed to retard the absorption of gas, in the later stages wet coal absorbed as much gas as dry coal. The "watered dust" experiments were conducted in air-tight vessels over mercury so there was no escape of moisture.

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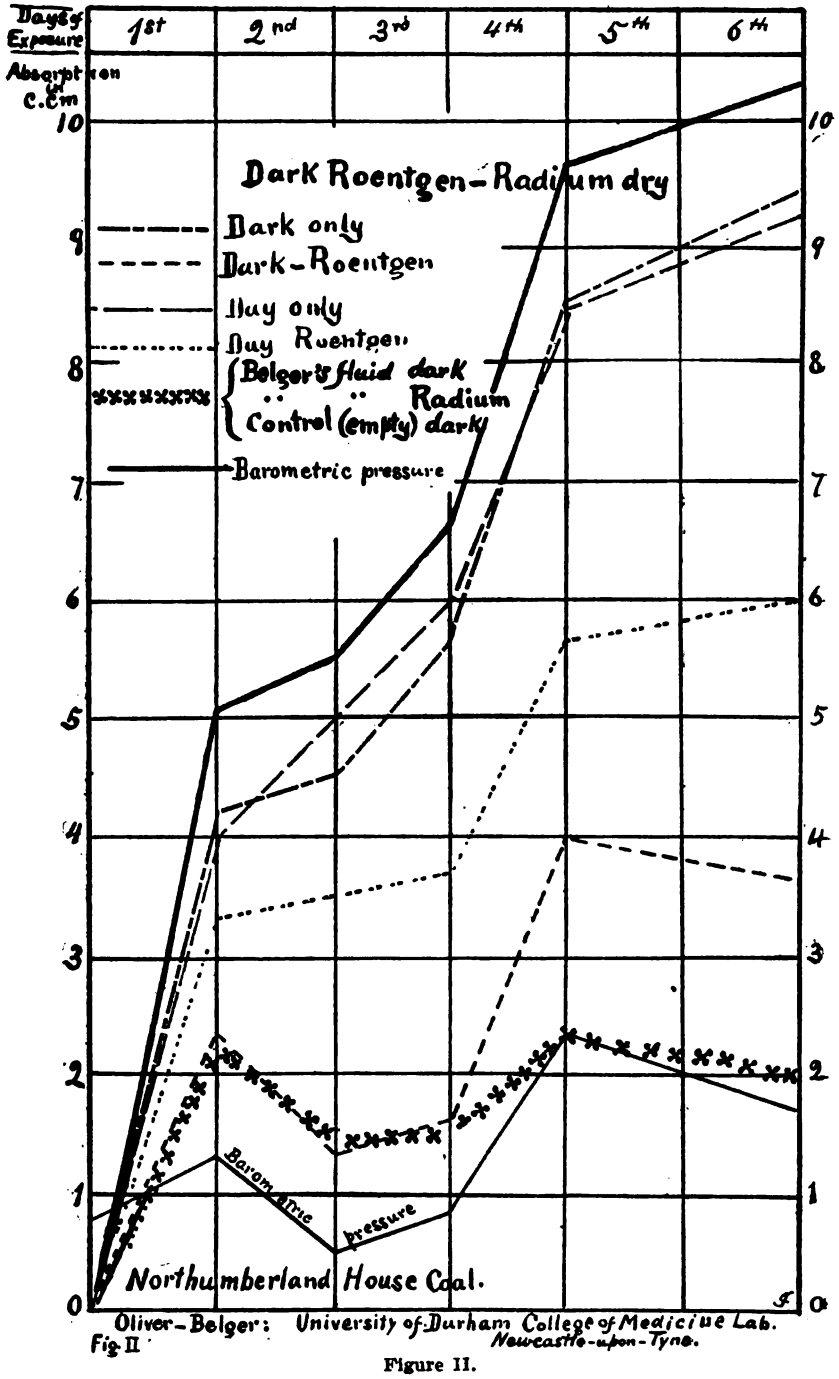

Figure II.

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In another set of experiments one volume of coal dust was placed in 24 volumes at atmospheric air over mercury. At the end of 110 days the gas absorbed equaled one-eighth of the total volume of the air; that is, was equivalent to three times the volume of coal dust. If we reckon that we have only oxygen to deal with, the coal would have absorbed five-eighths of the oxygen of the air. One volume of coal dust treated by Belger's fluid in 24 volumes of air over mercury had not absorbed any gas at the end of 110 days.

CAUSES OF DEATHS IN COLLIERY EXPLOSIONS.

What is the cause of death in colliery explosions? Men who work in the immediate neighborhood of an explosion may be killed out-

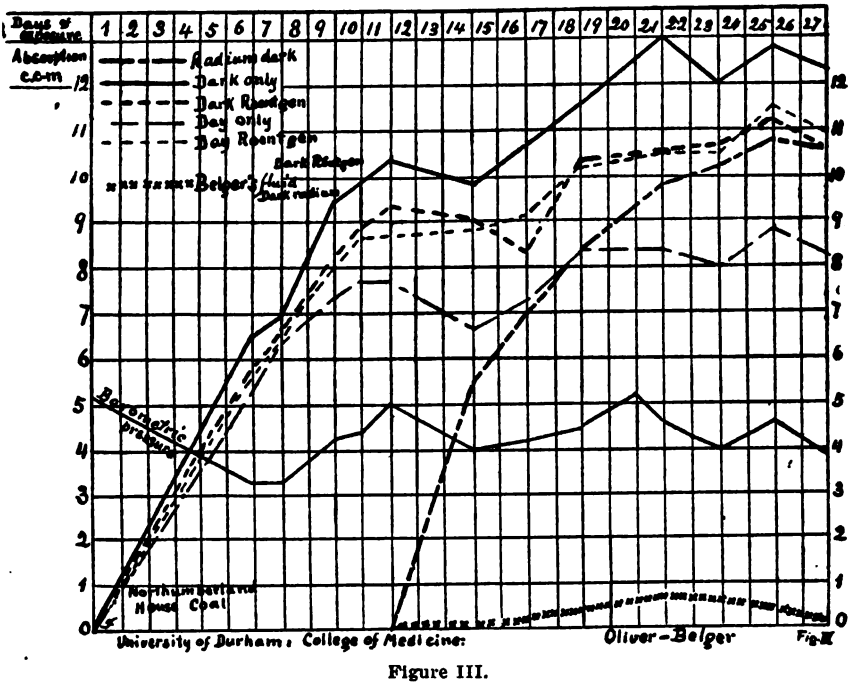
Days of exposure
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Absorption c.c.-m
Radium dark
Dark only
Dark Rontgen
Day only
Day Rontgen
Dark Rontgen
Belger's fluid Dark rontgen
Barometric pressure
Northumberland House Coal
University of Durham: College of Medicine
Oliver-Belger
Fig. II

Figure III.

right by sheer impact. The column of gas suddenly strikes them with all the force of a projectile. They are thrown down, dashed against the roadways, and their bodies possibly dismembered. In some cases, judging from the blackness of the skin and the charring of the body, death is due to burns, but, in a very large number of instances, death is the result of the inhalation of "after damp," or CO. To these may be added the fact that men who have passed through the immediate dangers of a colliery explosion and have recovered from the apparent effects of carbon monoxide poisoning may yet finally succumb to inflammation of the lungs. This was

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the fate of many of the miners who had been rescued at Courrières. They subsequently died of pneumonia. It has been suggested by Riembault that the inflammatory affection of the lungs is the result of breathing the extremely hot air of the mine or of inhaling particles of hot dust which burn the lining membrane of the respiratory passages and set up an ascending vagal neuritis. No trace of ulcer, however, is visible in the month, pharynx, or in the trachea after death. The pneumonia following CO poisoning usually develops from 36 to 72 hours after exposure to the gas, and if there is any preference at all for either lung to be affected, it is usually the right.

THE EFFECT OF EXPLOSIVES USED IN MINING.

Since the workmen's compensation act in Great Britain has come into force, several claims have been made against employers by miners who have been "gassed," when working with dynamite, gelignite, roburite, blasting gelatine, and so on. Bodily suffering and ill health have been attributed by miners to inhalation of the fumes given off by explosives and to working in air rendered foul by their detonation. Poisoning by nitrous fumes given off by explosives is scheduled for compensation in Great Britain. Elsewhere[5] I have raised the question as to whether, when the men are rendered hors de combat by such a cause, the harmful fumes are nitrous in character or whether the gas is not mostly carbon monoxide. Experiments carried out by Prof. Bedson[6] in regard to the explosion of roburite, a mixture of dinitrobenzene or chlorodinitrobenzene and ammonium nitrate, failed to reveal the presence of any dangerous gas. Neither carbon monoxide, nitric oxide, nor hydrochloric acid was found in the fumes, nor did the blood of a mouse suspended in the return air of the mine give any indication of CO, although in the return air CO to the extent of .042 and .019 per cent was found. After exploding tonite, which is a mixture of gun cotton and barium nitrate, the blood of a mouse exposed to the return air contained a trace of CO. Theoretically, when nitroglycerine compounds are detonated, they should give rise only to CO_2, N_2, and H_2O, but analyses of the air show the presence of such other gases as CO, H_2S, and NO. The oxide of nitrogen is found only when partial burning takes place instead of detonation. E. A. Mann[7] examined 266 samples of air taken after firing gelignite, blasting gelatine and dynamite, and he found that the amounts of CO varied from .043 to .539; CO_2 from .56 to 6.47; O_2 from 17.32 to 20.26; N from 76.19 to 80.11; but when South African explosives were used, the amounts of CO varied from .12 to .37 per cent and CO_2 from .78 to 10.63. He also found that if the cartridges were fired with the paper wrapper round them, the percentage of oxygen was diminished.

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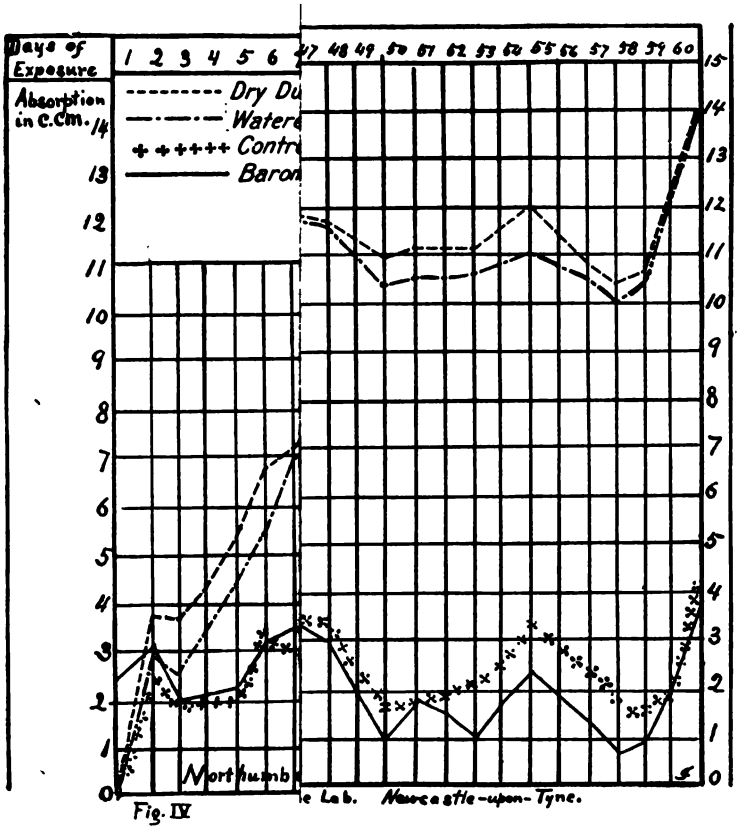

Fig. IV

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The injurious gases evolved after exploding gun powder are CO_2 and H_2S. After the detonation of any explosive in a coal mine, the air is for a period rendered impure, and were the degree of vitiation of the air measured alone by the amount of carbonic acid, tonite in this respect would be a greater offender than gun powder and roburite. Tonite produces also more CO than most of the other explosives. The CO is not produced directly, but by the heated CO_2 passing over the face of the coal and abstracting carbon from it. The fumes of roburite have a bitter almond smell, probably due to nitrobenzene, but there is not sufficient evidence to show that such symptoms as headache, vomiting, and drowsiness complained of by miners are due to the presence of nitrous compounds. If the symptoms are not due to inhalation of nitrous compounds, then to what are they to be attributed? Men overcome by carbon dioxide in the mine recover, if rescued in time and placed in the open air. Carbon monoxide behaves differently. It forms an extremely stable compound with the hemoglobin of the blood, and as it displaces volume for volume the oxygen of the blood corpuscles, even such a minute trace of the gas in the air as 0.04 to 0.001 per cent may form carboxyhemoglobin.

The subject of the effects of explosives upon miners has on the American side of the Atlantic been studied by Dr. Thomas Darlington.[8] His experience is based upon 1,300 cases of partial asphyxia and of poisoning caused by explosions of dynamite during the construction of the New Croton Aqueduct, New York. There are two types of poisoning, the acute and the chronic. When only a small amount of dynamite has exploded, or where the workmen have been immediately removed to the fresh air by their comrades, the trembling, flushing or pallor of the face, nausea, vomiting, throbbing of the temples, rapid heartbeat, and sense of fulness of the head usually disappear within 24 hours. Even where the workmen have been brought into contact with large quantities of the products, and have become giddy, unconscious, and asphyxiated, the coma usually passes away, and most of the patients recover. In some instances, however, death has come from respiratory failure. The symptoms are considered by Darlington to be due to volatilization of nitroglycerine, but there is a close resemblance between poisoning by carbon monoxide and nitroglycerine. Rabbits which were exposed by me to smoke given off by burning gelignite seemed at the time to suffer little inconvenience, but in the large cells of the brain of animals who died several weeks afterwards chromolytic changes were found. Structural changes in the nervous system can, therefore, be induced by the fumes of explosives. This raises an interesting point. We all admit that the work of a miner is hard. After firing an

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explosive, and when rock and mineral have been brought down, the débris has to be cleared away. It is possible that in the severe muscular strain which the shoveling necessitates, miners when thus employed are more likely to be affected by small quantities of carbon monoxide than on other occasions. We do not quite know what are the effects produced in men, when at work, by their repeatedly inhaling small quantities of dangerous gases. Take sulphuretted hydrogen, for example; we know how quickly it destroys life, but we hardly know its effects in small doses. Dr. Elizabeth Kojevnikoff[9] has drawn attention to degenerative changes which occurred in the cells of the brain and spinal cord in a dyer who for years had been employed in a dyeworks and who had handled daily large quantities of sulphide of soda. Pierracini alludes to the structural changes which take place in men who work in sewers, while Wachsmuth mentions pseudo-general paralysis as a sequel to chronic sulphuretted hydrogen poisoning. The reference which I have thus made to another poisonous gas is not without its application. Take the Durham coal miners; these men blame explosives for causing nystagmus. Apart from the attitude assumed by miners, when at work, the influence of eyestrain and of a feeble illuminant, I offer no opinion in support of the theory of the supposed casual relationship between the fumes given off by the higher explosives and nystagmus; but I can speak to the fact of nystagmus having occurred in one of my patients who was the victim of coal-gas poisoning, the hurtful ingredient of which is carbon monoxide. Reviewing the subject of the harmful effects of explosives upon coal miners, I am disposed to attribute these rather to carbon monoxide, than to nitrogen oxides.

Following upon these remarks comes the important question: What are the possible remote effects of carbon monoxide? Pneumonia sufficiently frequently develops in miners who have been exposed to the firing of explosives as to suggest a casual relationship between the two. Dr. Hotchkiss,[10] of the United States Public Health Service, states that in the Cripple Creek district one man died of edema of the lungs, probably the result of exposure to powder smoke, and that in the same district 20 similar cases had been reported within 10 years, of which 18 proved fatal. Dr. Dale Logan tells me of two men who returned to a particular working in a coal mine three and one-half minutes after having exploded 1 pound of gun powder. Shortly afterwards both complained of the foulness of the air and of their work becoming more difficult; they also had headache, giddiness, and vomiting. They made their way home, staggering all the way. In the case of one of the men speech was so thick that his wife could not understand what he said. Both men seemed to be intoxicated. During

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the night one of the men vomited frequently. Next day, although giddy and suffering from headache, he returned to work; but on the second day he developed pneumonia, and died from it on the fourth day. The pneumonia was regarded as the sequel of carbon monoxide poisoning, and compensation was awarded. Among South African miners pneumonia is extremely common. It is very fatal, both to white men and to black, owing largely to the diminished vital resistance, caused by breathing mine air charged with the products of explosives. Sudden exposure to air containing a large percentage of carbon monoxide gives rise to serious symptoms which immediately attract attention, but the effects produced upon men by the combined influence of fatigue and of breathing for several hours daily small percentages of carbon monoxide in the high temperature of the mine are not so well known. Although the symptoms observed in miners after the use of explosives are for the most part due to CO, it is not maintained that nitrous fumes can be inhaled with impunity. On the contrary, owing to their irritating properties, they set up congestion of the lungs with edema. In an ordinary way the symptoms appear much earlier than those caused by carbon monoxide. Shortly after exposure to nitrous fumes, a burning sensation in the nostrils and throat is complained of, followed by a dry, hacking cough and by expectoration frequently tinged with blood. Should the miner die, the mucous membrance of the trachea and bronchi is found to be acutely congested and there are signs of acute broncho-pneumonia and hemorrhagic edema of the lungs.

THE MANUFACTURE OF LUCIFER MATCHES AND THE ABOLITION OF PHOSPHORUS NECROSIS.

While this address was being penned, I received from Dr. John B. Andrews, secretary of the American Association of Labor Legislation, the joyful news that the United States Senate had passed a bill, which, by the prohibitive tariffs it imposes, viz, 2 cents per 100 matches, is likely to put an effective stop to the manufacture of white phosphorus and of matches made from it, while the law prohibits the importation of such matches into the country. This Congress on Hygiene unites with me in extending to the United States Government our congratulations on the wisdom of the step it has taken, and likewise to the American Association for Labor Legislation our heartiest congratulations for the vigorous campaign it has carried on for two years, and which now sees its efforts rewarded by success. As one of a small commission appointed by the British Government to make inquiries both at home and abroad into the danger of the use of white phosphorus in the manufacture of lucifer matches, I have seen something of the havoc to human life, and the greatness of suffering caused by white phosphorus. Since 1902, only 10 cases of

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phosphorus necrosis have been notified in Great Britain. The act prohibiting the use of white phosphorus in Great Britain came into force on January 1, 1910.

Phosphorus fumes attack teeth, especially decayed teeth, and cause death of the bone. As the necrosis extends, pieces of bone are either spontaneously discharged or are removed by operation. I show you lantern slides of the jawbones of a young matchmaker, aged 28, whom I saw with Dr. Louis Petz, of Györ, in Hungary. After 15 years' work in a match factory, the man developed necrosis of the upper jaw, the greater part of which Dr. Petz removed in June, 1911. After the operation the matchmaker seemed to make a good recovery, but a few months afterwards the disease reappeared in the remaining portion of the upper jaw, the temporal bone and the zygomatic process, and extended to the inferior maxilla as well. Patient having refused to submit to a further operation, gradually succumbed to the malady.

The case reminds me of a similar one which Dr. Petz had also under his care. He had removed the lower jaw from a young lucifer matchmaker, and had advised the man not to return to the factory. The advice was ignored; as a consequence, patient came back to the hospital a few years afterwards, and had a portion of the upper jaw removed. He made a satisfactory recovery, and was again advised not to return to the match factory. For a second time the advice was unheeded, with the result that the necrosis attacked the occipital bone, and caused death by meningitis.

Apart from the acute suffering in the early stages, the dangers to a workman invalided by phosphorus necrosis are septic poisoning, broncho-pneumonia, and meningitis.

It is the men who mix the paste in open vessels and who head the matches by dipping them in the composition, also the women who fill the boxes, who suffer most. They are more exposed to the fumes of the phosphorus, but there is hardly a person employed in a match factory who does not at some time or other incur the risk of phosphorus poisoning. In a match works near Buda-Pest I found that a mason who had been called in to make some structural repairs close to the dipping chamber, became affected by the fumes and developed "phossy jaw." It is important to remember that phosphorus necrosis may not show itself in a lucifer matchmaker until several years after a man or woman has left off working in a factory.

WHAT IS THE CAUSE OF PHOSPHORUS NECROSIS?

There is not the least doubt that the fume given off by white phosphorus is the cause of the disease. The fumes are rich in oxides of phosphorus. My colleague of the lucifer match inquiry of the Home Office, Sir Edward Thorpe, exposed decayed teeth to the fumes of

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white phosphorus for 13 hours, and he found that they lost 0.37 per cent of their weight; also carious teeth exposed to a weak solution (1 per cent) of phosphoric acid lost 8.9 per cent of their original weight. The atmosphere of any poorly ventilated lucifer match works is impregnated with the garlic odor of phosphorus. From 100 liters of air drawn from one of the factories, Thorpe obtained 0.02 milligram of phosphorus, and from an equal quantity of air removed from the boxing room he obtained 0.12 milligram. In addition to the unhealthy atmosphere in which these people work, the phosphorus clings to the hands and fingers of the women who fill the boxes with matches. From the hands of a boxer there is emitted an unpleasant garlickly odor, and in the dark the hands glow. On analyzing the water in which 22 workpeople had washed their hands on leaving the factory, Thorpe found 37.3 milligrams of phosphorus.

Phosphorus fumes when inhaled become dissolved in the saliva of the mouth, and they readily attack décayed teeth. How far the disease of the jawbone is to be regarded as the outcome entirely of the chemical action of phosphorus oxide, or how far the oxides simply prepare the tissues for the operation of microorganisms, it is difficult to say. Prof. Lewin, of Berlin, believes that phosphorus acts as a phosphorus molecule, and that in this form it combines with the tissues. Prof. Stockman, of Glasgow, having found in the pus escaping from "phossy jaw" a few tubercle bacilli, has raised the question as to whether the malady may not be tuberculous. There are in the mouth other microorganisms much more virulent than tubercle bacilli, and to them I am disposed to attribute the principal, if not the entire rôle, in the destruction of the jawbone. There is something peculiarly human in phosphorus necrosis. Dogs kept in the boxing rooms of lucifer match factories did not suffer. Animals were exposed by me to the fumes of white phosphorus and to the smoke from burning phosphorus for a considerable length of time, without phosphorus necrosis being induced, and Stubenrauch of Munich had similar experience. Lewin, on the other hand, succeeded in inducing in rabbits swelling of the maxilla with cheesy degeneration and the formation of new bone.

Constitutional as well as local effects are produced by phosphorus. In Marseilles my attention was drawn by Dr. Arnaud to the occurrence, especially in female matchmakers, of a peculiar cachexia characterized by pallor, dyspepsia, the presence of albumen in the urine, and a tendency to bronchitis. To this constitutional state the term "phosphorisme" is applied. Although in Great Britain we are not familiar with "phosphorisme," there is another manifestation of the constitutional effects of phosphorus which deserves consideration. I refer to the ease with which the long bones become fractured, especially in dippers.

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It is more than likely that in all civilized countries there will be in future no further cases of industrial phosphorus necrosis. Setting aside the manufacture and use of the ordinary "safety" matches, to the prefix of which experience shows these matches are entitled, we have in the sesquisulphide of phosphorus, on the whole, a harmless and efficient substitute. Sooner or later, all the world over, including India and Japan, matches will be made from this or some other harmless compound, so that posterity will not have imposed upon it an unhealthy industry, which in our day and generation has been the cause of much suffering and of many a cruel and painful death. The purification of the lucifer-match industry is not only evidence of what beneficent legislation has accomplished, but is an indication that where changes of methods of manufacture from the point of view of health become imperative human skill and ingenuity can rise to the occasion.

THE FUMES OF MERCURY AND THEIR EFFECTS.

In furriers who prepare skins by means of nitrate of mercury, cachexia, swollen gums, loss of teeth, salivation, and tremor of the hands are the characteristic symptoms of mercurial poisoning. Men thus affected become sad enough objects to look at, but I had to go to the mercury mines on Mont Amiata, in Italy, to see for myself what human wrecks the fumes of mercury are capable of producing. In the company of Prof. Pierracini and Dr. Giglioli, I motored from Florence, through the Chianti district of Tuscany, to Mont Amiata. The mine is an old one. There are traces that it was worked by the Etruscans. The ore, which is a heavy cinnabar, is smelted by means of wood. The miners are a healthy class of men, and they retain their fitness for work. It is the smelters who suffer. The best account of the maladies of mercury smelters is that written by Giglioli. Along with him and Pierracini I had the opportunity of examining several of the smelters, affected and nonaffected. It is when the men during smelting examine the test holes that the fumes escape which do bodily harm, also during the removal from the furnace of a black metallic scum, rich in free mercury. The symptoms of poisoning commence slowly, usually after a year or two, and are loss of appetite, inflamed and bleeding gums, with occasionally epistaxis. Giglioli has observed a tendency to a spurious form of hæmophilia, so that in the event of a wound having been received bleeding is with difficulty arrested. Subsequently tremor develops, which becomes exaggerated on effort, recalling the intentional tremor observed in disseminated sclerosis. If the men are suddenly called upon to stop when in the act of walking, they can not immediately arrest their progress. Involuntarily they take an extra step or two forward, then backward, and, swaying from side to side, they occasionally fall. If an attempt is

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made to take a drink, the hands become so agitated that it is impossible for the glass to reach the lips. The whole body becomes agitated, the contents of the vessel are dashed over the man's clothing, or they are spilt upon the ground. One of the men attempted to write his name in my notebook, but on taking up the pencil his hand shook so violently that he had to steady it with the other hand, and even then the writing was so jerky as to be undecipherable. So violent sometimes are the tremors in this form of poisoning that the men become utterly helpless; they are unable to walk or even stand still, to dress or feed themselves; they are obliged to remain in bed and be fed by mother, wife, or daughter.

If the smelters after a slight attack of poisoning absent themselves from work for a period, they generally recover, but on returning to the smelting ovens there is a rapid reappearance of the symptoms and of illness, which lasts longer than the preceding attacks. There is established anaphylaxia, or an increased tendency to be adversely influenced by the mercury fumes with, in addition, a tendency to be readily intoxicated by small quantities of alcohol. No age is exempted. There is nothing like the salivation and the loosening of the teeth and ulcerated gums with which we are familiar in ordinary mercurial poisoning.

The symptoms I have described differ to some extent from those observed in industrial mercurial poisoning in England and elsewhere. The submaxillary glands are not enlarged. It is interesting to note that among the mercury smelters of Mont Amiata syphilis is unknown. Since the symptoms exhibited by the mercury smelters in Italy do not exactly correspond with those observed in men working in quicksilver and its compounds, it seemed to me possible that some of the symptoms might be due to other metals present in the ore; but on a chemical analysis of the ore being made in Newcastle-upon-Tyne, the percentage of selenium present was found to be too small to cause poisoning.

DUST, DISEASE OF THE LUNGS, AND TUBERCULOSIS.

The association of dust with disease of the lungs and bronchi has long been known. Ramazzini, in 1703, was familiar with the respiratory diseases of potters and their relationship to dust.

What becomes of dust when it is inhaled? It is a natural supposition that, while some of it reaches the lungs, the major part of it is retained in the nares. Saito,[11] working in Prof. K. B. Lehmann's laboratory in the Institute of Hygiene in Würzburg, has tried to determine experimentally the fate of dust breathed by workmen in factories. In his preliminary experiments dogs and rabbits inhaled air charged with white-lead dust from 1 to 33 hours. He found that the greater part of the dust was subsequently recovered, not from the lungs, as might have been expected, but from the alimentary

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canal. In five out of six experiments 4 to 24 per cent of the total amount of lead dust breathed in was located in the respiratory organs and the remainder in the digestive. In an ordinary way the dust caught in the nasal mucous membrane mixes with the mucus which is secreted and is unknowingly swallowed. Experiments were also carried out on man with white-lead dust, the mouth and nares being previously carefully washed. The experiments were conducted from 10 to 15 minutes on 20 occasions, care being taken by the men not to swallow the saliva. Inspiration and expiration took place through the mouth and nose, singly and combined, with the result that, provided sneezing did not take place, 95 per cent of the dust inhaled remained behind in the body, 50 per cent of which was primarily retained in the nares. By processes of exclusion 12 per cent probably finally found its way to the lungs, for the bulk of the lead dust, 60 to 80 per cent, was recovered from the alimentary canal. Saito's experiments demonstrate that the principal portal of entrance of soluble dust into the body when inhaled is the alimentary canal and not the lungs. Where two such channels of entrance as the respiratory and alimentary are so close to each other, it is not always easy to say upon which the dust has exerted its baneful influence. In Laborde's experiments with guinea pigs exposed to air laden with fine white-lead dust, the animals died within two hours. In the lungs were found intense congestion and ecchymoses. When the exposure was less intense and the animals lived longer, similar but equally profound vascular changes were found in the lungs, pointing, therefore, to direct irritation by dust.

Just as the ciliated epithelial cells of the trachea form a protective barrier to dust reaching the lungs, so does sneezing exercise a protective function in the same direction. When, as a result of repeated exposure to dust, this function is lost, it becomes absolutely incumbent upon men and women, after working for a few hours in a dusty occupation, to carefully rinse and cleanse the nostrils by warm water before leaving the factory.

Another important question calls for consideration: What is the relationship between dust, inflammatory affections of the lungs, and tuberculosis?

On this side of the Atlantic, Mr. Frederick Hoffman[12] in "Mortality from consumption in dusty trades" deals with this subject in a masterly manner from the financial point of view. The waste of human life in industry is enormous. Taking the manufacturing and mechanical industries of the United States for 1900, the general death rate was 13.8 per 1,000 and the consumption rate 2.6, or 18.8 per cent of the mortality from all causes, whereas in men following an agricultural calling the consumption rate was 1.5, or 9.5 per cent of the mortality from all causes. Estimating the wage earning population

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(male and female) of the United States at the age of 15 and over for 1908 at 31,768,943, and assuming the death rate from consumption to be 2.2 per 1,000, the numbers of deaths of wage earners during 1908 would be approximately 69,892. By factory inspection, and by effective means for the prevention and removal of dust, nearly one-half of these lives at least could have been saved.

Until recently inhalation was regarded as the only method whereby dust could reach the lungs, but the results of the experiments undertaken by Von Behring, Calmette,[18] Guerin, Vansteenberghe, and others to determine whether pulmonary anthracosis is not more frequently the result of particles of pigment absorbed through the intestinal canal and carried hence by the lymphatics to the lungs, have shaken the belief in aerial infection. Tuberculosis in persons employed in factories and workshops is known to have been caused by inhalation of floor dust contaminated with the expectoration of a tuberculous workman. Weichselbaum took some such dried expectoration, pulverized it, and made a spray of it. Of 17 dogs who inhaled the spray, all of them developed tuberculosis, while in a control experiment with other forms of dust none of the animals suffered in the least. Twelve years ago Cornet published the results of an interesting experiment undertaken to demonstrate the important pathological rôle played by desiccated dust in the air. Spreading a carpet upon a floor, he caused sputa of tuberculous persons to be strewn upon it. When the carpet was dry, he swept it two days in succession in such a way as to raise the bacilliferous dust. Cornet had previously placed into the carpeted room 254 guinea pigs at heights varying from 7 to 184 centimeters above the carpet. All the guinea pigs contracted tuberculosis. In each instance the disease commenced in the respiratory organs. Cornet protected himself in this dangerous experiment against the possible infection of tuberculosis by tamponading his nostrils with cotton wadding. On inoculating guinea pigs with the material removed from the nasal tampons, he caused in three animals tuberculosis. In a similar way, Strauss, by inoculating animals with the material removed from the nasal tampons of 29 healthy persons who were frequenting hospitals, caused tuberculosis in fully 50 per cent of the animals thus treated. These experiments show the comparative ease with which tuberculosis in the lungs can be caused by the inhalation of infected dust. If tubercle can produce its own special effects in the lungs, so, too, can dust.

In my own experiments I found that fine coal dust, injected into the peritoneal cavity of animals, was transported through the body for considerable distances. By circuitous lymphatic paths the dust reached the lungs and bronchial glands. Several large particles of coal dust also made their way into such glands as the testes. There

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is plenty of evidence to show that the development of pulmonary anthracosis by the intestinal canal, as maintained by Calmette and Petit, is a possibility, but that on this account the intestinal canal should be regarded as the mode by which insoluble dust more frequently reaches the lungs rather than by direct inhalation, I am not prepared to admit. The engorgement of the lymphatics in the deeper structures of the bronchi and around the blood vessels strengthens the suggestion of an intestinal source of infection, but the changes observed in the alveoli of the lung in the early stages of anthracosis point to irritation of their epithelial lining by direct contact with dust. I quite admit with Calmette that it is not always easy, experimentally, to get either dust or microbes into the lungs, and yet I have succeeded in setting up in the dog anthracosis limited to one-half of the lungs. Vansteenberghe, Grysez, and others failed to produce pulmonary anthracosis in animals when by tying the œsophagus swallowing of dust was prevented. In Great Britain one of the strongest adherents of the intestinal theory of anthracosis is Prof. Whitla of Belfast. To the opinion expressed by Von Behring that pulmonary tuberculosis of the adult is frequently the result of a probable intestinal infection contracted in childhood, I unhesitatingly add the testimony of my own experience. On examination, however, of sections of the lungs in early anthracosis, it seems to me that the manner in which the large epithelioid mobile cells take up particles of fine pigment such as soot and coal dust from the pulmonary alveoli, and transport them through the alveolar wall into the lymphatics and thence to the bronchial glands, suggests that these particles are primarily lying in the alveoli of the lung, and could only have reached these spaces by inhalation. Alveolar irritation is followed by a desquamative catarrh and by reactive inflammation of the underlying connective tissue. It matters little whether the particles of dust pass into the connective tissue framework of the lung by forcing the barrier between the alveolar epithelial cells, whether they pass in through stomata, or are taken up by phagocytic cells. Since many of the particles are larger than the phagocytic cells, these particles can only be washed along by the lymphatic fluid. Once pathological changes due to dust are set up in the lungs, the tendency is for structural alterations to advance, and for the ordinary spongy texture of the lung to be replaced by dense unyielding fibro-connective tissue. In its early stages, pulmonary fibrosis is solely the result of irritation caused by dust.

In 1902, at the close of the South African War, I drew attention in the pages of the Lancet to the large number of miners who were returning to England from the Transvaal only to die of gold miners' phthisis. The subject attracted the attention of the colonial office. Shortly afterwards a commission was appointed in South Africa

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by Lord Milner to inquire into the prevalence of miners' phthisis on the Rand. Since then, in addition to the admirable report by Dr. John S. Haldane on the health of the Cornwall miners, Dr. Summons has reported upon the miners of Bendigo, and Dr. Cumpston upon those of Western Australia. In the United States disease of the lungs caused by dust occurs with considerable frequency in men who work in the lead and zinc mines of Missouri and the deep mines of Utah and Nevada. In the Transvaal the men work in badly ventilated mines at very great depths, 4,000 feet and more, at a temperature of 83° F. and considerably higher. The particles of dust given off from the rock are extremely hard and angular. In South Africa miners' phthisis has only become the scourge it is since rock drills came into use. As rock drillers are the men most exposed to dust, they have the highest mortality rate from phthisis; but as the dust pervades the mine generally, all underground workmen are more or less exposed to its evil influence. Many of the men who consulted me in Newcastle-upon-Tyne had gone a few years previously from the Northumberland coal mines to South Africa to make their fortune, and within 5 or 6 years they came home with sums of money varying from £1,000 to £1,200 ($5,000 to $6,000) or more, but some of them with their health shattered. These men had worked hard when in the mines; to them time was money. After firing explosives they were in the habit of returning to the working without giving ample time for the fumes to clear away and for the dust to settle. As the miners are therefore working always more or less in a vitiated atmosphere it is difficult to say how much of the pneumokoniosis of the South African miners is the result of inhalation of dust, how much of it is caused by inhaling the fumes of explosives, how much, too, by chilling of the body and catching cold, owing to the rapid transference of the miners by means of lifts when overheated and fatigued at the close of the day's work, to the surface. These three causes doubtlessly cooperate, but since rock drillers suffer most frequently it would appear as if dust is the prepotent agent for harm. Of 3,136 South African miners examined by the medical experts of the second commission[14] 930, or 32 per cent, were classed as having miners' phthisis in one or other of its stages, so that if the total number of underground miners on the Rand be taken as 11,400 the number affected would probably be about 3,600, not including the miners who at present are the subjects of the disease. Of 787 rock drillers examined 48 per cent, or nearly one-half, were found to be suffering from phthisis, as against 21 per cent of miners who had not used rock drills at all. After 3½ years of rock drilling the percentage of men suffering from phthisis keeps rising, until it reaches 79 per cent in the sixth year. Reviewing these facts, it is sad to think that after 4½ years of work in rock

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drilling 50 per cent of the men come under the fatal grip of this dust-binding disease of the lungs. It would be interesting to know at what particular stage in its development silicosis becomes a serious and progressive malady, but, unfortunately, there are no exact means of knowing, for the lesion develops insidiously; and yet, once the pathological changes are well established, the disease may run a fairly rapid course. Forty-two men examined by the South African medical experts died 5½ months after becoming incapacitated for work, but in my own patients this time was exceeded by several months. The longer a patient survives the greater is the risk of his lungs becoming infected by tubercle. In one of my patients, a rock driller for 5 years, the fatal pulmonary illness only assumed an active form 3½ years after his return to England, while another succumbed to well-marked pneumokoniosis nearly 7 years after leaving South Africa. Through all these 7 years some structural change had been silently creeping over this man's lungs. His tale was a sad one; he was the last survivor of 36 men who had gone out from England to the Transvaal, all of whom had worked close to each other 7 years previously.

In my early cases of gold miners' phthisis the physical signs showed that the disease was located for the most part toward the base of one or other of the lungs. The men, although bronzed and healthy looking, were yet the subjects of a difficulty of breathing on the slightest exertion, a difficulty of breathing far in excess of what the physical signs on examination of the chest suggested. In its inception pneumokoniosis is a nontuberculous disease; it is the direct result of dust irritation. The course of the malady is hastened by the recurrence of bronchial and pulmonary catarrh. The changes set up in the lungs by previous catarrh prepare the soil for infection by tubercle; but in some of my patients the disease ran its course from commencement to finish without becoming tuberculous. Within recent years a change has apparently been taking place in the mines on the Rand. Ten years ago, when I first drew attention to gold miners' phthisis, there was a much smaller percentage of tuberculous disease amongst the men than in recent years. In making this statement I am supported by the medical experts of the recent commission, who report that it was the opinion of the medical men on the Rand who examined patients in 1902–1904, that at that period miners' phthisis terminated fatally without any clinical or bacteriological evidence of tubercle and that men continued at work until a week or two of their death, which often came by heart failure, with cyanosis and urgent dyspnœa. Death indeed sometimes came to men quite suddenly from heart failure when they were working in the mine. As it is not always easy to find the bacilli of Koch in the sputum even of ordinary cases of pulmonary tuberculosis, so their absence for months from the expectoration of a gold miner is no proof

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that the disease in him is not tuberculous. When, however, tubercle bacilli are absent all through the illness and the lungs after death do not give evidence either macroscopically or microscopically of tubercle, then gold miners' phthisis in its typical form is nontuberculous. Sooner or later, as the malady progresses, tubercle becomes grafted upon the pulmonary lesion, and with the invasion of the microorganisms the character of the illness becomes almost immediately changed. While the hard and fibrotic portion of a lung of a gold miner is not a suitable soil for microorganisms, the concurrent catarrhal conditions in other parts of the lungs offer little resistance both to the bacillus of Koch and the pneumococcus of Friedländer, and yet I have seen a Rand miner with silicosis in the early stage develop an acute inflammatory affection of the lungs, with high temperature and with physical signs indicating extensive consolidation, make an excellent recovery. In the case I refer to the microorganism found in the expectoration was the bacillus catarrhalis. In the Transvaal the high mortality rate of miners from pneumonia led the mining authorities of South Africa a few months ago, with the view of treating the disease by a vaccine, to call to their assistance the service of Sir Almroth Wright. The high death rate from pneumonia and the increasing number of cases of gold miners' phthisis, which in later years have been assuming a tuberculous type, raises the question as to whether the mines themselves or the lodgings of the men may not be partly responsible for this fact.

The South African mines offer a good field for the application of further preventive measures on the lines I have indicated. To get rid of miner's phthisis on the Rand the dust question must be more seriously tackled than it has been. Spraying the rock with water under high pressure at the time the drill is being used allays dust, keeps the temperature cool locally and for the moment, and it makes the work more comfortable for the men when drilling; but in a hot mine evaporation readily takes place, rendering the air humid, so that the work becomes fatiguing, while the dust which was wetted becomes dry once more. There is danger to the men from inhalation of the fine dust deposited everywhere, and which is raised into a cloud by ventilation, haulage, the use of explosives, and the shoveling of débris. We have been experimentally led to believe that on lines of treatment similar to those suggested for coal mines much of the stone dust of the South African and other mines could be allayed. Apart from the saving of human life and averted suffering by such treatment of the dust the financial gain to the owners of itself calls for the defect being dealt with on lines more vigorous than those hitherto adopted. Experiments lead us to believe that this can be done. In my laboratory South African mine dust, treated by the fluid previously referred to, and exposed for several days to a temperature of 107° F., in an atmosphere dried over concentrated sulphuric acid,

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was found after three months' exposure to atmospheric air to be moist and adhesive; whereas dust wetted with water and similarly heated became on drying more pulverulent than before.

I have said enough in this address to show that dust, fume, and gas are capable of inducing acute and chronic affections of the lung, and that by reducing local and general resistance they pave the way for the entrance of the tubercle bacilli and other such organisms, as the pneumococcus. Dust, fume, and tubercle, separately or combined, are the common enemy of all industrial life. Were I speaking of dusty trades in detail, and not of dust in general, it would be well to draw a distinction between the various kinds of dust, since some are more harmful than others. In Bavarian statistics the various kinds of dust are distinguished. Prof. Kaup, of Charlottenburg, tells us that the mortality from tuberculosis due to mineral dust amounts to 4.6 per 1,000 living, vegetable dust is responsible for 4.3, and metallic dust for 3.7; whilst the mortality from tuberculosis in occupations free from dust is only 2.1 per 1,000 living.

Since dust is the foe of workmen means ought to be employed for its removal from factory and workshop. General ventilation is all very good, so long as the question is simply one of a vitiated atmosphere due to the air having been rendered impure by the respiratory products of the workpeople, and by artificial heating and lighting, but where the dust is generated by machinery or is evolved during the ordinary course of production general ventilation only disseminates the dust, so that recourse must be had to local ventilation such as is afforded by an exhaust apparatus. Exhausts are superior to water spraying. The wearing of respirators is no doubt in many instances a necessity, but the men complain of the heat engendered by them and of the restraint imposed upon their breathing. Still it remains a fact that men working in color grinding, when they have taken to wearing respirators, have recovered the weight they had lost and regained their health.

If anything further were required to show what can be done to improve the health of the workpeople by removal of dust, I need only to refer to the data supplied by Wittgen in a small industry. This writer, dealing with the health of men employed in a cement works, tells us that while formerly the number of cases of disease of the respiratory organs amounted to 9.3 per cent., this figure sank to 3.3 five years after the introduction into the factory of measures for the removal of dust. The duration, too, of all other forms of sickness decreased. In 1908, 2,742 days of sickness had been compensated, but in 1910 only 812. It cost the employers 29,000 marks per annum to install and keep the machinery running. Against this had to be placed the pecuniary advantage gained by the saving of wages and the recovery of waste material, which amounted to 20,000 marks, not including the smaller expenditure in medical administration and

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the financial gain to the establishment through the improved health of the workers.

If, in these remarks on the danger of dust and fume, I have wearied you with details with which you are already familiar, I can only throw myself upon your indulgence. We have seen how, under the influence exerted by the International Association for Labor Legislation upon various governments, the laws which regulate industry and methods of production in various countries are being brought more and more into line. The abolition of the use of white phosphorus in most of the civilized countries is a victory which that society, through the Berne Convention, can rightly claim. Had it done nothing else, this alone would have more than justified its existence. Can this congress in its deliberations not make itself felt through members and delegates upon the various nations represented here this evening? We deplore the absence of uniformity in the mode of collecting and presenting statistics of industrial disease. Compulsory notification of industrial diseases is a step in the right direction. Could all countries not adopt a scheme of compulsory notification of industrial diseases, and agree as to the definition of these and their causation? By that means the first important step would be taken of establishing uniformity in the method of collecting and arranging occupational statistics. International clinics might follow, also some international method of collaboration be adopted, which would serve not only a useful end but, in its own particular way, would be helping to forge another link in the chain making for the federation of nations, the unity of the medical profession, and the brotherhood of man.

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[1] Der Einfluss des Rauches auf die Atmungsorgane, Stuttgart, Verlag von Ferdinand Enke, 1905.

[2] Biologia, Sept. 15, 1911, p. 312.

[3] The Medical Examiner, Dec., 1907.

[4] Lancet, Vol. 1, Apr. 20, 1912, p. 1072.

[5] Lancet, 1911.

[6] Transact. Instit. Mining Engineers, Vol. II, 1890–91.

[7] Report on the Composition of Gases caused by Blasting in Mines. E. A. Mann, Chief Inspector of Explosives for Western Australia, 1911. Perth, Fred. W. Simpson, Government Printer.

[8] Medical Record, 1890, pp. 38, 661, 662.

[9] Bulletin de la Société Royale des Sciences Médicales et Naturelles de Bruxelles. No. 3, Mars, 1912.

[10] American Labor Legislation Review, February, 1912, p. 134.

[11] Experimentelle Untersuchungen über die quantitative Absorption von Staub, Dr. Yoichiro Saito. München, Arch. f. Hyg., Bd. LXXV.

[12] Bulletin of the Bureau of Labor, No. 79, Nov., 1908, p. 831.

[13] Recherches Expérimentales sur la Tuberculoses Dr. Calmette and others, Paris, Masson, 1907.

[14] Report on Miners' Phthisis and Pulmonary Tuberculosis in Mines within the Union of South Africa, Cape Town; Cape Times (Ltd.) 1912.

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ON MORTALITY AND THE CAUSES OF DEATH ACCORDING TO OCCUPATIONS.

Dr. JACQUES BERTILLON, Chief of the Bureau of Municipal Statistics, Paris, France.

The death rate by occupations is one of the most difficult topics in statistics; hence it is undoubtedly that the tables needed for studying it occur so seldom. In order to be serviceable they should include above all an age classification. Any occupation pursued mainly by the young will always show a low death rate, however unhealthy it may be; and any occupation pursued by aged people will always show a high death rate, however healthy it may be. No occupation is less painful than that of living on an income, and yet we find a high death rate in this group, because most of those following it are aged men who are enjoying the property that they have accumulated during their active lifetime.

It is further needful that the occupation should be reported at a census in the same way that it is reported on the death certificate. The aim is to compute the following ratio: Among 1,000 persons of a given age, practicing a given profession, how many died? We need then two comparable figures—first, the number living, and, secondly, the number who died. This condition is less difficult than might be thought. As we are constantly asked during our lifetime what our occupation is, we form habits so that our reply finally becomes uniform. It is then only necessary not to interfere with this habit by subordinate questions in order to justify the hope that the occupation stated on the census schedule will agree with that appearing on the death certificate. This last requirement involves the obligation of excluding from our computation all occupations defined in too general terms, such as "business man" and "laborer," without further explanation.

I am acquainted with only 12 tabulations which satisfy the two conditions I have named:

1 to 4. English tables, the earliest being the work of William Farr.

5 to 6. Two Parisian tables made under my direction.

7. A French table recently published by my colleague, M. March, and which he has kindly shown me in proof.

8. A Swiss table.

Finally I will mention the following tables, although the number of the observations which they cover is too slight:

9 to 10. Two Scotch tables.

11. A table for laborers of the city of Vienna.

12. A table for Leipzic.

Furthermore, you will see in the exhibition connected with this congress the important contribution made by Mr. Hoffman, statistician to the Prudential Insurance Co., Newark, N. J. Unfortunately, while

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Mr. Hoffman gives the number of deaths by age, by cause, and by occupation, he has not been able to give the number of living persons in the groups from which they come.

The English tables are the oldest; they have been constantly improved and are the most instructive. They have been studied by my colleague, M. Pulligny, in his book on Industrial Hygiene.[1]

When I presented before the meeting of this congress in London in 1891 my first table comparing mortality by occupations, my colleagues generally thought me too bold in discussing a subject which appeared to them so difficult. They were right. It then appears to me necessary to compare the 12 tables mentioned above, in order to see how far they confirm one another. That is the purpose of the report I am now making.

In order to be significant, such a comparison should relate to the causes of death. Unfortunately, these are given in only three tables, two English and one Parisian (disregarding the table for Leipzic, because the number of cases is too small, and the Swiss table, which gives some hints on the subject).

So I have made for each occupation a diagram like Diagram A, which relates to printers. In each country I compare the death rate at a given age in each occupation with the average death rate in all the countries at the same age. I call the death rate for the occupation high, when it noticeably exceeds that average, and low, when it is noticeably under it. In my opinion it would be a mistake to proceed otherwise. This average mortality is represented in the diagram by white rectangles; the mortality of the occupation by shaded rectangles; and, in all cases, the two are side by side.

We see, then, from Diagram A:

1. That the mortality of printers is high (i. e., above the average mortality) in Switzerland, in the two Paris tables, and the earliest of the English; but in England it has decreased so much that the death rate of printers above 35 years of age is below the average.

2. The main causes of the high death rate of printers in Paris and England are, first, phthisis; and, secondly, in a subordinate way, Bright's disease (caused by lead poisoning). Switzerland also shows a high mortality from phthisis.

3. Other causes of death contribute also to the mortality of printers in Paris, but not in England, where this occupation is less unhealthy. I have sought to learn the reason for this difference. I have inquired whether English printers are more careful and more cleanly than those of France. The English factory inspector of whom I asked the question replied that he could not compare them, but that the English printers were very uncleanly.

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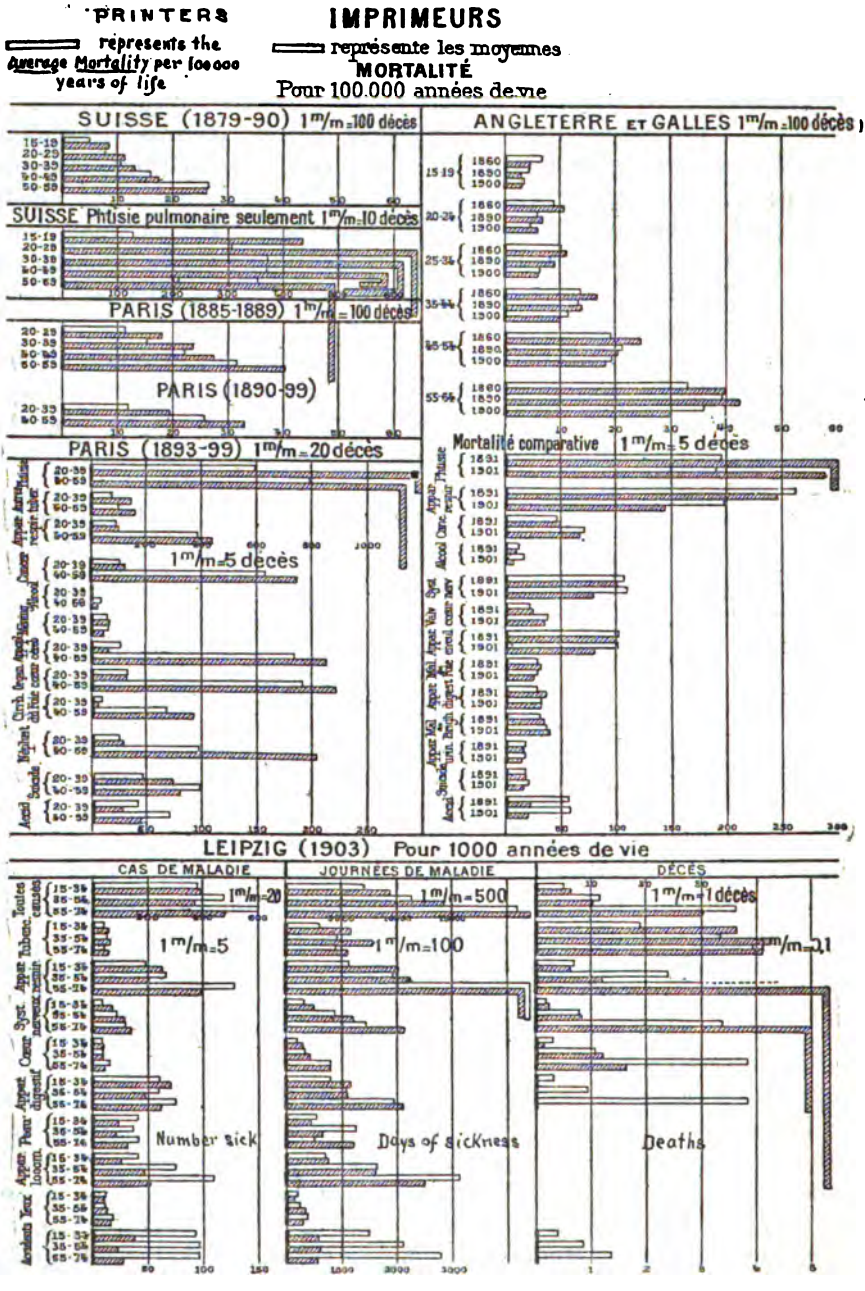

Diagram A.

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The figures regarding the frequency of disease in England are calculated according to a different method from that which I followed in Paris, and in consequence the results are not perfectly comparable. English methods are too complicated to be explained here. I would say only that the method is ingenious, but wrong in not involving an analysis according to ages.

Such an analysis is very interesting. I have calculated the elements of it, so far as printers are concerned, and present the results in diagram B. You see that phthisis among printers becomes more and more common as the age of the person increases. Bronchitis and especially pneumonia are infrequent. Liver diseases, which rarely appear in early adult life, become common after 55 years of age. (The Parisian table shows the same results.) Bright's disease, infrequent before 45 years of age, becomes thereafter more and more common. I can not go into similar details for each occupation. It has appeared to me best to study each of the main causes of death in the various occupations so as to reach general conclusions, if possible, and to that task I now proceed.

TUBERCULOSIS OF THE LUNGS, OR PHTHISIS—GENERAL CONCLUSIONS.

Diagram C shows that the frequency of phthisis varies much with the occupation. If a man is poisoned either by alcohol or by lead, phthisis is very common. It is common also in most occupations in which the man is exposed to dust, especially mineral dust. It has an average frequency in occupations pursued in confined quarters. It is infrequent with shopkeepers, in the liberal professions, and especially among farmers, as well as in most occupations carried on in the open air and involving muscular exercise. It is very uncommon among iron and coal miners. These are the general conclusions indicated by my figures and the diagram. They are subject to many exceptions which should be examined more closely.

GROUP I.—*Occupations exposing one to spirituous liquors.*—Here the maximum death rate is found at ages from 35 to 54. In youth inn servants and hotel servants have very low death rates. They enter the profession in health, and under 20 years of age they show a death rate much below the average, indicated by the dotted horizontal line on the diagram; between 20 and 24 years they reach or pass the average. Between 25 and 34 the rates are enormous. From 35 to 54 they rise to double and treble the other occupations exposed to phthisis. The deadly effect of these occupations increases in proportion as one carries them on for a longer time.

Brewers under 25 years of age likewise have a low mortality; then the mortality becomes high, but very much less than that of innkeepers.

Malsters are included for the sake of contrast. They are not exposed to distilled spirits, and among them phthisis is rare.

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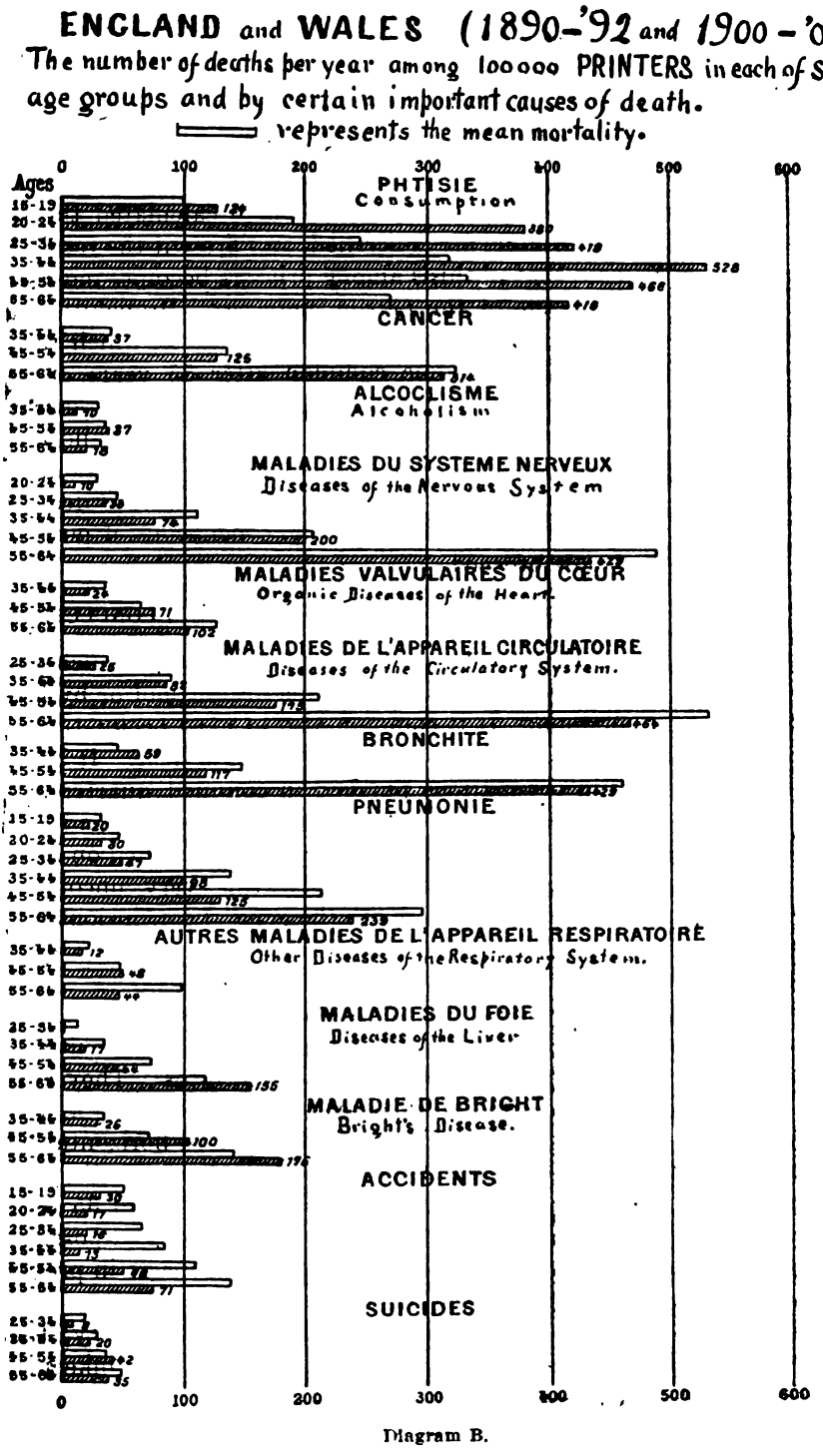

Diagram B.

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PULMONARY TUBERCULOSIS by ages and occupations.
(ENGLAND 1890-'92 and 1900-'02) 1‰ = 15 deaths per 100000 years of life.

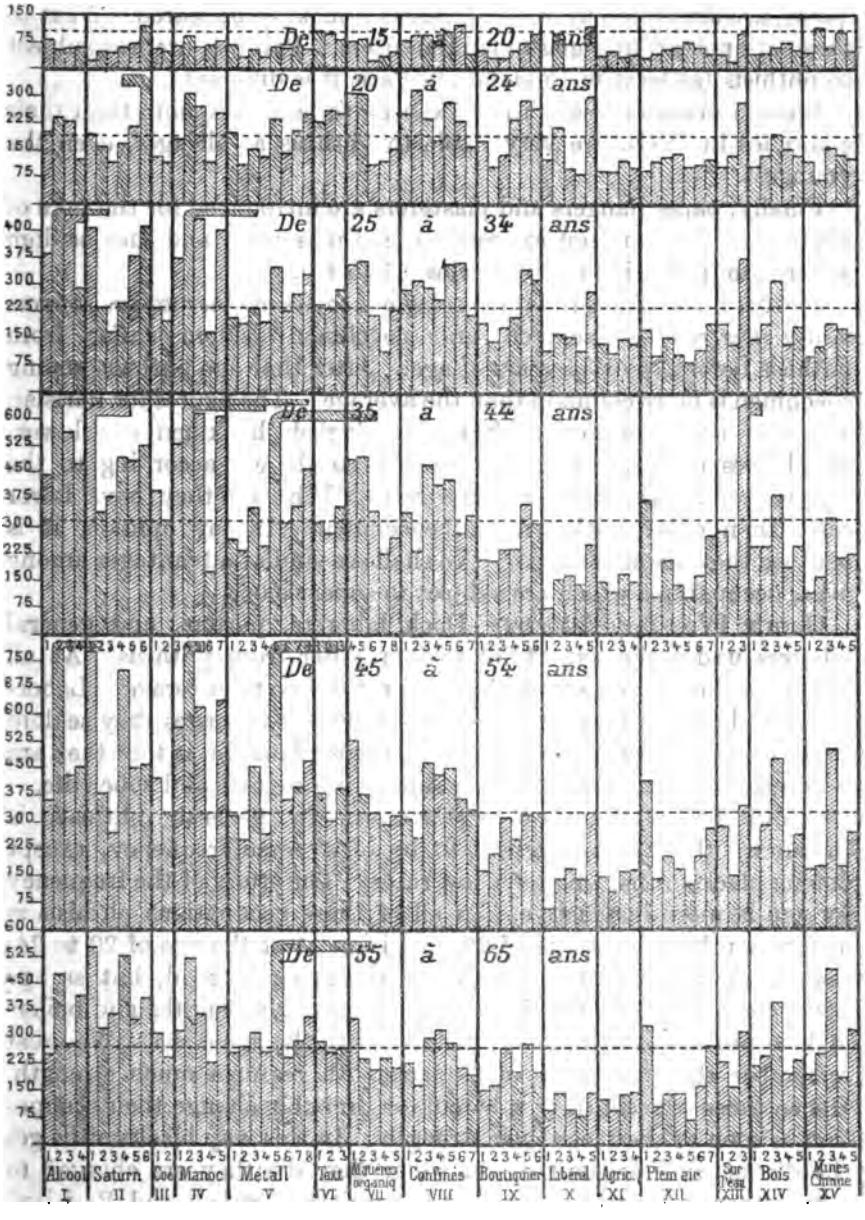

Diagram C.

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GROUP II.—*Occupations exposed to lead poisoning.*—Phthisis before 25 years of age is uncommon, which shows that this occupation is recruited from healthy persons. After that it becomes frequent or very frequent. File makers, among whom lead poisoning is most frequent, are also those by whom phthisis is most to be feared. Next to these are potters and glass manufacturers. Painters are less subject to phthisis (at least in England; in Paris it is different).

English printers, though less exposed to lead poisoning than their comrades in Paris, are very liable to phthisis at all ages, even the youngest.

Finally, paper hangers and plasterers are introduced for the sake of contrast. They are not exposed to lead poisoning, and they seldom suffer from phthisis (except at ages 35 to 44).

GROUP III.—*Occupations exposing one to the weather without opportunity of exercise.*—Hackmen and coachmen seldom suffer from phthisis before 25 or 35 years of age. After that age phthisis among coachmen is more common than the average. The figures for Parisian hackmen are enormous. Those for English hackmen are lower. Employees on tramways, and private coachmen, according to the English summary, show average rates. Why do they have lower rates than other hackmen and coachmen? In my opinion, it is because they are supervised. We shall see similar advantages among other occupations which are subject to supervision.

GROUP IV.—*Day laborers.*—Dock laborers, porters, and general laborers under the age of 20 seldom suffer from phthisis. At all later ages they have very much higher rates than the average. Laborers on railways are introduced for contrast. At all ages they seldom suffer from phthisis. In my opinion, the explanation is that they are supervised, and in consequence subject to a regular and sober life.

GROUP V.—*Metallurgical occupations.*—In general, phthisis is shown by the English figures to be of average frequency, except among blacksmiths, who have low rates. The study of the frequency by age is more instructive. In all of these occupations phthisis is uncommon before the age of 20, and in most at the age of 20 to 24; then it rises above the average; so the stock is good, but as age advances health becomes impaired. Among blacksmiths and boilermakers phthisis is infrequent, at least until the age of 55. We must remember that the trade of a blacksmith requires much strength. Hence those who contract tuberculosis probably change their occupation as soon as they lose their strength. In this way blacksmiths get the disease as blacksmiths, yet when they die they are charged to some other occupation. Among locksmiths (English and Parisian) above the age of 45 phthisis becomes common. Among English cutlers it is very common—three times the general average—a rate almost

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comparable to that among the inn servants. Perhaps one can explain this as due to the use of files and millstones, and to the resulting metallic dust.

GROUP VI.—*Textiles.*—English figures show that these occupations have an average frequency of phthisis, and an analysis by age shows that in the earliest age period phthisis is somewhat more common than the average. In all textile industries phthisis is frequent between 20 and 24 years of age. So this industry is recruited from feeble stock and at first phthisis makes great ravages among them. At later ages it sinks to or even below the average.

GROUP VII.—*Occupations exposing one to organic waste.*—The English figures show that phthisis is uncommon among tanners (and this is confirmed by the figures for Paris). It is of average frequency among curriers, and uncommon with millers and bakers (Parisian bakers have the same advantage).

The analysis by age in five of these occupations yields the following results: In all, phthisis before the age of 20 is uncommon, indicating that the stock from which they are recruited is good, but with hatters and hairdressers phthisis becomes very common at the later ages, and especially between 20 and 34 years. It does not sink to the average until after the age of 55. With butchers, though phthisis is very rare before the age of 25, it is on the whole of average frequency (they often suffer also from alcoholism). The same facts are revealed with Parisian butchers. With millers and bakers, on the contrary, phthisis is rare up to the end of life. Millers appear to share in the advantage of the farmers. Thus, there is a great difference between hatters and hairdressers on the one side, and millers and bakers on the other. Like hatters and hairdressers in this respect are furriers, workers in skins and horsehair, as indicated by the English figures. They breathe dust composed of cut skins, and thus irritating, and phthisis among them is very common. On the other hand, millers and bakers breathe soft vegetable dust, and among them phthisis is rare. Finally, tanners, curriers, and butchers deal with animal matter which is decayed, but gives out no dust. Among them phthisis is rare, except with butchers, where its average frequency is probably due to other causes.

GROUP VIII.—*Occupations carried on in confined places.*—The English figures show an average frequency of phthisis for all such occupations. Formerly tailors and shoemakers had a higher rate. The analysis by age shows that the stock for all these occupations is average, a fact easily explained; they are quiet occupations appealing to persons who are weak and liable to tuberculosis. Phthisis shows at least an average frequency among them at ages 15 to 20. At all other ages it is common, or very common. Railway clerks are the

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only exceptions. Although derived from average stock like the others, and although subject to a high mortality from phthisis up to about 35 years of age, yet at later ages they have favorable figures. Commercial clerks have an average mortality up to the age of 55. Among domestic servants the mortality from phthisis is low up to the age of 35, and average above that age.

GROUP IX.—*Shopkeepers.*—Phthisis is rare or very rare among all shopkeepers. The same is true in Paris for grocers and fruiterers. Bakers and booksellers constitute an exception, the mortality from phthisis among them being average, as it is in the textile industries and in occupations carried on in confined places.

GROUP X.—*Liberal professions.*—Phthisis is very rare here, and this is more remarkable as the stock from which they come is mediocre. According to the rather small figures, phthisis does not seem common until the age of 25. At later ages it is very uncommon. Two professions are exceptional; druggists, among whom phthisis is common up to the age of 35 years, becoming then more moderate; and musicians, who have very high figures; but the latter occupation, as we shall see later, is ill defined.

Occupations exposing one to the weather but involving vigorous exercise.—These I have divided into three classes:

GROUP XI.—*Farming.*—Here phthisis is very rare.

GROUP XII.—*Industrial workers.*—Phthisis here is very rare. It is most rare with shipbuilders and especially masons—the English summary mentions that the latter have a slightly higher rate than the average. An analysis by age shows that phthisis is very rare up to the age of 25, and somewhat so up to the age of 35. At the later ages it rises more and more above the average, and after 55 far exceeds it. So the stock from which these occupations draw is good, but they slowly exhaust those who carry them on. Masons, especially stoneworkers, though they work in the open air, breathe mineral dust; this seems less harmful than the dust breathed by hairdressers and hatters, and even less harmful than that breathed by cutlers and lock makers, but more harmful than the vegetable dust breathed by bakers and millers. Undoubtedly other elements besides dust may cooperate in the result. Those I mention have the advantage of being logical and agreeing with the data.

GROUP XIII.—*Occupations pursued upon the water.*—Phthisis is rare among fishermen, of average frequency among bargemen, and very frequent among common seamen. Thus there are very great differences between these three occupations, although they resemble each other in so many respects.

GROUP XIV.—*Industries employing wood.*—In all of these occupations phthisis is rare in the early ages. It becomes frequent only

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with wood turners and coopers, but coopers are often alcoholic—they are not content with making barrels, but also know how to empty them.

GROUP XV.—*Miners.*—Phthisis at the earlier ages is very uncommon among coal miners. The same fact is noted in France. In England it is very rare among iron miners. On the other hand, it is very common with miners of copper, tin, and especially lead. This result has surprised English statisticians, who confirmed it by special inquiries, but did not explain it. Quarrymen show favorable figures up to about 35 years of age, then average figures until about 45, thereafter worse and worse. So the stock from which this occupation draws is good, but it taxes the men who carry it on. Perhaps the frequency of phthisis among quarrymen, like that among masons and stoneworkers, may be ascribed to the inhalation of mineral dust.

GROUP XVI.—*Chemical industries.*—Phthisis is rare in these, but the English figures show a somewhat high figure for workers in rubber.

ALCOHOLISM.

The number of deaths entered under this head is always and everywhere very much below the number of persons dying from it. This is easily explained; when a man dies of sclerosis of the liver, or phthisis, or cerebral hemorrhage, the physician enters that cause without investigating to what it was due, and usually without being able to investigate. He enters what he sees, and is right in so doing. Alcoholism is entered on the death certificate only when the case is one of acute intoxication, or when the person dies of several diseases all due to alcoholism. Incomplete as the returns are, they permit us to study occupations in which the abuse of alcohol is common. The figures in this respect are conclusive.

At the head naturally are innkeepers and barkeepers. Their business obliges them to drink alcoholic liquors, and they absorb alcohol also through the lungs, since they breathe air charged with its vapor. Brewers are not so badly situated among the alcoholic occupations. Malsters, on the contrary, show average figures. Occupations exposed to lead poisoning are seldom alcoholic. Printers show figures below the average, and potters have favorable rates. Paper hangers and plasterers are a little more often alcoholic, but they hardly belong to this group. Occupations in which one is exposed to the weather without exercise, such as that of coachmen, show a high death rate from alcoholism both in England and in Paris. Domestic coachmen, on the other hand, seldom die from alcoholism. This occupation is supervised and drunkenness hardly tolerated. Tramway employees are still more carefully supervised and remarkably sober.

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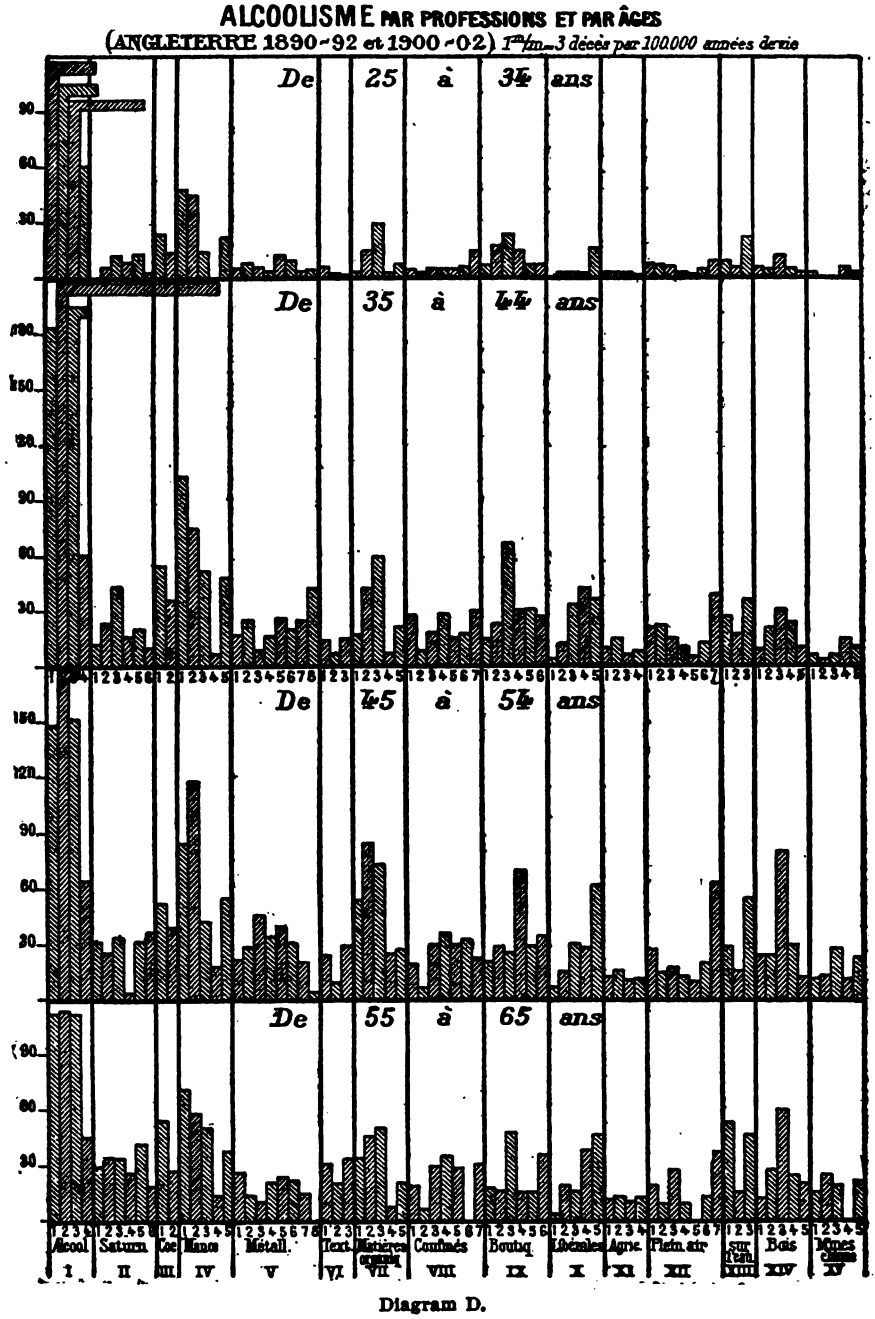

Diagram D.

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Among day laborers, common workmen and especially dock workmen are very alcoholic. Peddlers have an occupation in which many take refuge and show a remarkable proportion of alcoholics. Quite different are railway laborers, among whom the different classes are strikingly sober. They are carefully supervised.

Most of the metallurgical occupations are slightly alcoholic; usually they show average figures. (Lockmakers in Paris are a misleading exception.)

Among textile workers alcoholism is rare.

Among occupations exposing one to organic waste, hair dressers are often alcoholic, butchers still more often. On the other hand, tanners and curriers are seldom alcoholic; millers and bakers still more seldom. If the figures may be trusted, the bakers of Paris are more sober than those of England.

Occupations carried on in confined places.—Alcoholism here is not common; it is uncommon among clerks and especially railway clerks where they are carefully supervised. Among domestics alcoholism is of average frequency. The same is true of shopkeepers. Grocers in England are notably sober, but not in Paris; and likewise fruiterers have average figures in England and high figures in Paris.

Learned professions.—As one would expect, the clergy are extremely sober. The same is true of teachers, also, but less so of lawyers and architects and especially of physicians (at least in England, while in Paris alcoholism among them is rare, the proportion being only one-fourth of what it is in England). English druggists are also alcoholic. We are surprised to see this vice widespread in an occupation where it is peculiarly inexcusable.

Occupations carried on in the open air but with abundant exercise.—Among farmers alcoholism is very rare. In the industrial occupations of this group, like masons, alcoholism is not quite so rare. Commercial travelers are often alcoholic. In occupations pursued on the water alcoholism is of average frequency. Still it is very frequent among common sailors. English miners are sober (except perhaps copper miners). Workers in chemicals, whatever their special line, show low rates.

DISEASES OF THE RESPIRATORY SYSTEM.

The different diseases of the respiratory system are closely connected; in fact, when pneumonia is common in an occupation, usually bronchitis also is common. We confine ourselves then to studying the figures for all diseases of the respiratory system, except phthisis. In general terms we may say that usually these diseases are common in occupations where phthisis is common. But to this rule there are many exceptions.

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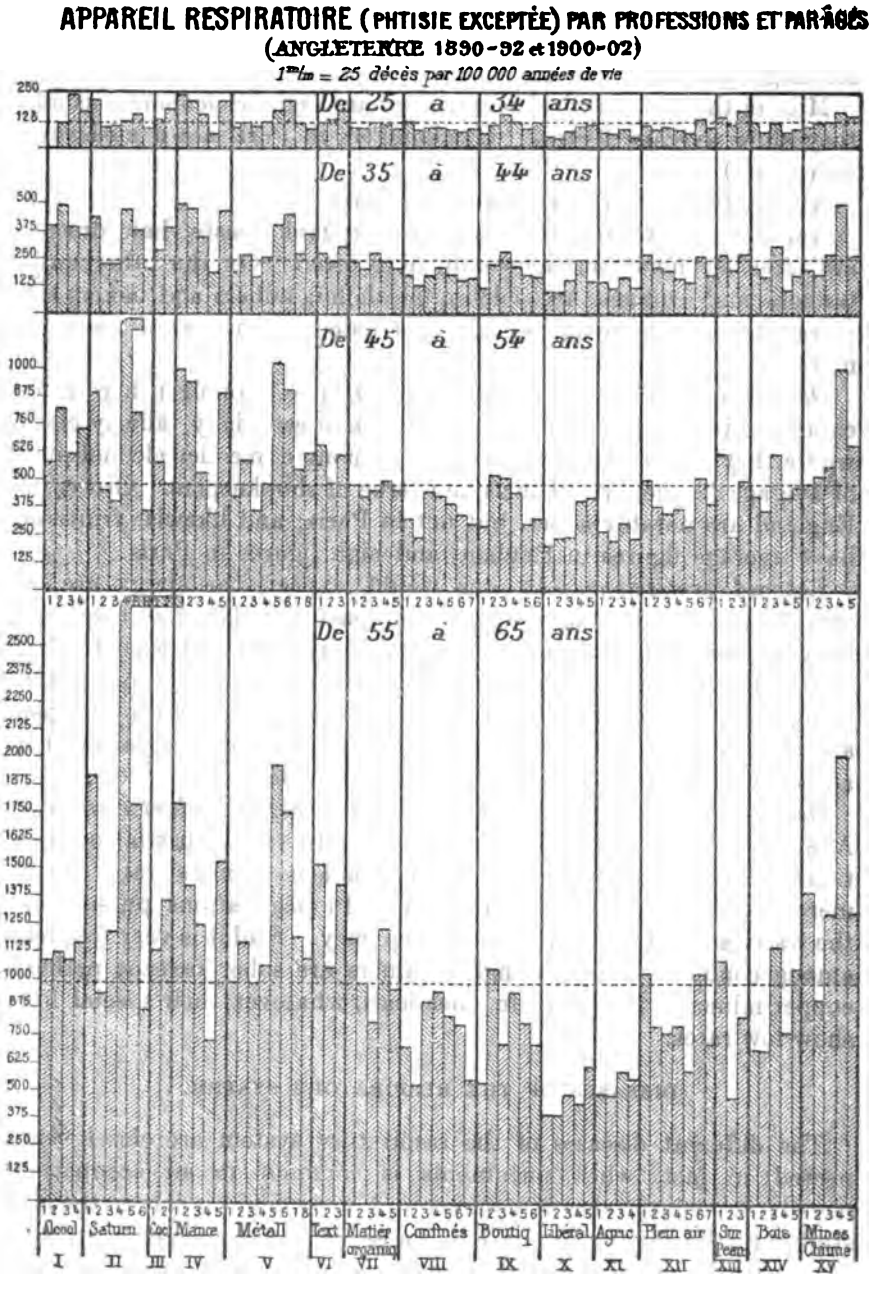

Diagram E.

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The following comments apply to the two most prevalent diseases in this group—pneumonia and bronchitis. Like phthisis, they are especially common in occupations where one is poisoned by alcohol or lead; they are uncommon among shopkeepers; very uncommon in the learned professions; very uncommon also in agriculture. They are uncommon in most occupations carried on in the open air and involving exercise. Unlike phthisis, they are uncommon in occupations carried on in confined space. They have an average frequency among miners. They are very common in occupations manufacturing chemical products and similar industries. These are the general rules indicated by the table. They are subject to many exceptions which should be more closely examined.

Occupations exposing one to spirituous liquors.—These diseases, especially pneumonia, are very common in all such occupations after the early years. The low or average figures before the age of 25 thus are doubly serious. Malsters are different. Among them pneumonia and bronchitis, like phthisis, are uncommon.

Occupations exposed to lead poisoning.—Pneumonia and bronchitis, like phthisis, are very common with file makers, potters, and glass makers. They have only average frequency with painters and plumbers. On the other hand, with printers (who are very subject to phthisis) bronchitis is rare and pneumonia more rare. With paper hangers and plasterers (occupations not exposed to lead poisoning) these two diseases have an average frequency.

Occupations exposing one to the weather without free exercise.—Among hackmen pneumonia and bronchitis, like phthisis, are only a little above the average. This is contrary to what might have been expected. (Paris coachmen have more favorable figures.) Carmen have higher rates in Paris than in England. Tramway employees and domestic coachmen have average rates for these diseases, as for phthisis.

Day laborers.—As in the case of phthisis, the figures are very high for dock laborers, peddlers, and day laborers. Porters have a little lower figure. Railway laborers have average figures at all ages, just as they do with phthisis.

Metallurgical industries.—Here, too, the figures in some degree duplicate those of phthisis. There is one difference, however; while phthisis is rare with those entering the occupation, pneumonia and bronchitis are not. These show the average frequency at ages 15 to 24, and keep it at later ages. In the same way as phthisis, they have an average frequency at all ages for most of these occupations (it is the same at Paris for occupations of this group). Cutlers and tool makers have much larger figures than they do for phthisis. On the other hand, lock makers, who are very subject to phthisis, have quite favorable figures after 35 years of age.

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Textile workers.—Workers on cotton, hemp, and flax have average rates as they do for phthisis. Workers on hosiery have much more favorable figures. Dyers share in the very high mortality of the chemical industries which they resemble in so many respects.

Occupations exposing one to organic waste.—Parisian tanners have low figures, and it is almost the same for English tanners and curriers, while furriers and workers in skins and horsehair (already mentioned as having a high death rate from phthisis) are also subject to other respiratory diseases. Hatters have average rates, and, what is more unexpected, hairdressers, who so often suffer from phthisis, have very favorable figures, as do other occupations carried on in confined air. Butchers have average or favorable figures. It is the same with English millers and bakers. (In Paris the bakers above 45 years of age are less favored.)

Occupations carried on in confined spaces.—All of these occupations in Paris and in England have very favorable figures (it has appeared that they are much subject to phthisis).

Domestics.—Mortality is very low at all ages.

Shopkeepers.—Mortality low or very low at all ages in Paris, as in England.

Learned professions.—Mortality very low at all ages; still the English doctors rise almost to the average at the ages from 35 to 54. In Paris they have very favorable figures at all ages. It must be noted that the life of a physician in Paris is very different from that of a country doctor whose time is spent largely in an open carriage. Most of the doctors in a great country like England are country doctors.

Occupations exposing one to the weather, but involving free exercise.—These have been divided into four special groups:

1. Agricultural occupations: The mortality is very low at all ages.

2. Industrial occupations: Mortality low, except with masons, where it is average (bronchitis being very frequent among them). With brickmakers and shipbuilders it is above the average. It is low with mechanics and very low with railway mechanics. Workmen on the railway have a little higher rate. Commercial travelers are much above the average. All these remarks are identical with what was said regarding phthisis.

3. Occupations pursued on the water: Pneumonia and bronchitis are very rare among fishermen, but common with bargemen and sailors, who are more often alcoholic. This agrees with what was said of phthisis.

Industries using wood.—The mortality, which is low before 25 years of age, is then about average (a fact noted also in Paris of carpenters and joiners). An exception should be made for wood

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turners and coopers, who are more exposed. This is almost exactly what has been noted regarding phthisis.

Miners.—Although phthisis is very rare among coal and iro miners, pneumonia and bronchitis are not very rare, and, especially after the age of 45, they have an average frequency. Marked changes in temperature are common in this industry. These two diseases are still more common with quarrymen who are exposed to mineral dust.

Chemical industries.—Although phthisis is rare in these industries, pneumonia and bronchitis are frequent. The same is true regarding makers of chemical products, properly so called, and gas makers. Workers on soap and rubber, and especially paper makers, have lower rates.

DISEASES OF THE LIVER.

The main one of these diseases is sclerosis of the liver. The Parisian statistics distinguished only this one disease of the liver. We do not find as close a relation between the frequency of these diseases and the frequency of alcoholism as might have been expected.

Occupations inviting alcoholism.—Diseases of the liver are very common, as might have been foreseen in all occupations exposing one to distilled spirits (except malsters, who show very moderate rates).

Occupations exposed to lead poisoning.—Diseases of the liver are uncommon up to the age of 55; after this age is passed they are of average, or more than average, frequency.

Occupations exposing one to changes of temperature and preventing exercise.—Although alcoholism is not uncommon among coachmen and drivers, diseases of the liver are only of average frequency among coachmen, and less common among drivers (in Paris sclerosis is rare among coachmen and more common among drivers). As might have been expected, these diseases are uncommon among street railway employees, and very uncommon among domestic coachmen.

Day laborers.—Although much addicted to intemperance, dock laborers and porters show low rates, peddlers and day laborers average or low rates. It seems that the violent exercise required of these different kinds of day laborers makes the alcohol do less damage to the liver (but not to the lungs, which very often, as we have seen, are diseased). As might be expected, diseases of the liver are very uncommon with railway laborers.

Metal workers.—Diseases of the liver are uncommon in these occupations before the age of 45; after this age is passed they are average. Nevertheless they are uncommon with lock makers and cutlers (so

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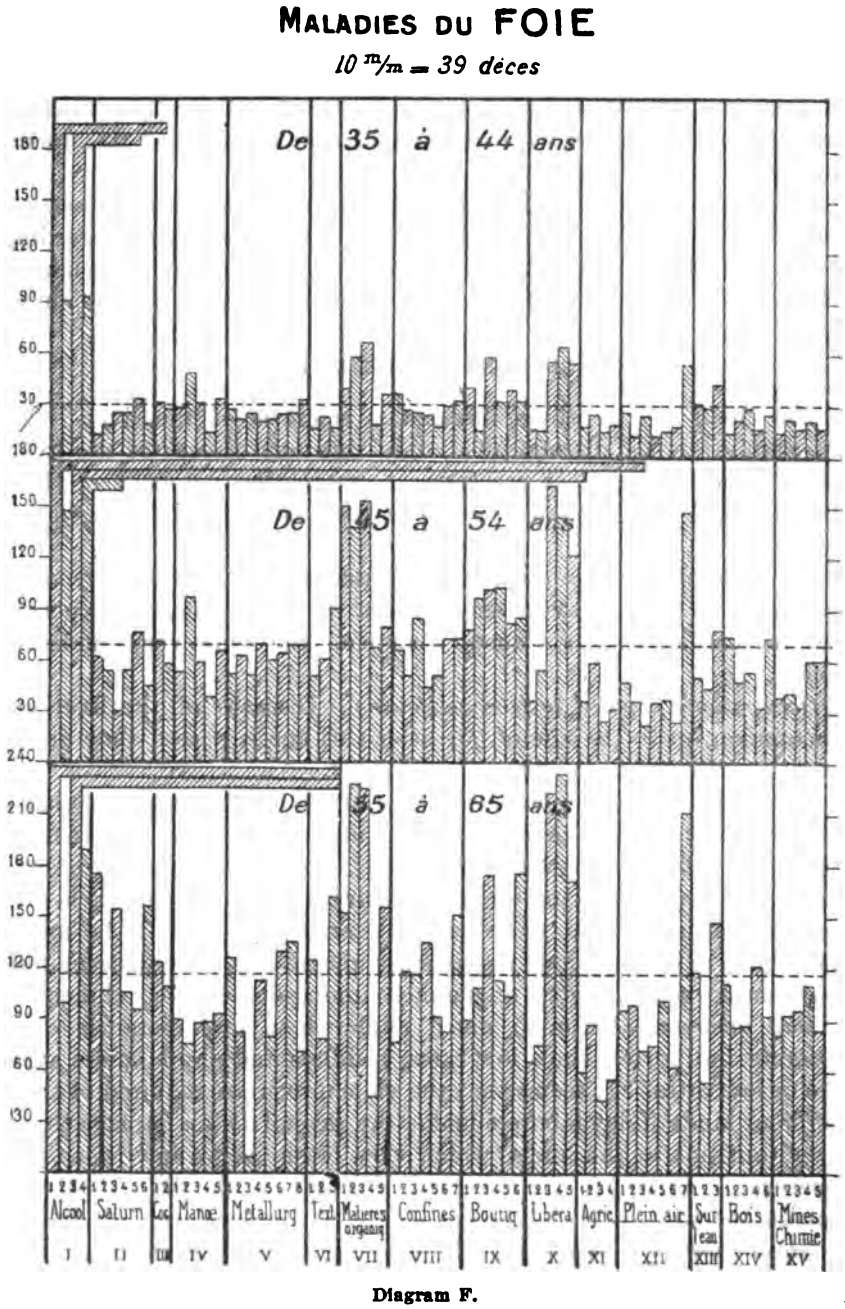

Diagram F.

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subject to phthisis and diseases of the lungs). The Parisian figures concerning machine makers and metal turners are quite favorable.

Domestic workers.—The figures are favorable up to about 55 years of age; between 55 and 64, less so.

Occupations exposing one to organic waste.—Diseases of the liver are very common from 35 years up to the end of life among hatters, hairdressers and butchers (in Paris sclerosis is more common than the average among hairdressers, and especially among butchers). This noticeable frequency deserves examination.

Bakers have average figures, but still somewhat high (at Paris sclerosis is frequent among them). Millers have very favorable figures (they share in the advantage of the farming classes).

Industries carried on in confined places.—Liver diseases are rare up to the age of 45, then rise to or above the average, both in Paris and in England.

Domestic servants.—A little above the average at all ages.

Shopkeepers.—All groups are above the average from 35 years, or at least from 45 to 55. Fish dealers and poulterers are conspicuous for frequency of liver diseases. In Paris grocerymen and fruiterers are often subject to sclerosis after the age of 45.

Learned professions.—Clergymen and teachers have very favorable figures, all the others abominable ones, especially lawyers and English doctors (in Paris, doctors show average rates).

It is the more remarkable because these occupations are favored in almost all other respects (except diabetes). Although alcoholism is more common among them than would be expected in intellectual occupations, still it can not explain these high rates.

Occupations exposing one to the weather but allowing vigorous exercise.—Diseases of the liver are very uncommon among farmers and in industrial occupations of this class. Bargemen have figures somewhat less favorable. Seamen at all ages are a little above the average. Among commercial travelers liver diseases become more and more common as age advances.

Woodworkers.—Liver diseases have an average or moderate frequency (sclerosis of the liver is of average frequency among Parisian carpenters).

Mine workers.—Very uncommon among iron or coal miners, diseases of the liver are of moderate frequency among the miners of Cornwall, who are so badly off in other respects. Diseases of the liver are very uncommon among quarrymen.

Chemical industries.—Rubber workers are the only ones among whom liver diseases are common.

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BRIGHT'S DISEASE.

This disease is very common among occupations subject to poisoning by alcohol or lead.

Occupations exposed to alcoholism.—It is very common in all occupations exposed to alcoholism, except malsters, among whom it is rare.

Occupations exposed to lead poisoning.—It is very common in all of these, especially with file makers (an occupation in which lead poisoning is more frequent than in any other). English printers who have escaped lead poisoning are rarely subject to Bright's disease before they reach 45 years of age; but after that age they are. Paper hangers and plasterers are introduced for contrast. They are rarely subject to lead poisoning, and rarely to Bright's disease.

Occupations exposing one to the weather without exercise.—Bright's disease is a little more common than the average among coachmen (the same is true of Paris coachmen); English drivers have favorable rates, especially after the age of 45, while Parisian drivers have high rates at all ages.

Day laborers.—These have very high figures especially in the early years, while the rates become better after 45 years of age, and entirely satisfactory after the age of 55. It seems that the causes of nephritis among men are not as prominent as in occupations exposed to alcoholism or lead poisoning. Railway laborers are a fortunate exception, as in almost all cases Bright's disease is uncommon among them at all ages.

Metal workers.—Bright's disease is only of moderate frequency up to about 45 years of age, then it rises to and above the average. The same is true for Paris. Boiler makers have favorable figures in Paris as well as in England. On the other hand, lockmakers in Paris, as in England, rise further above the average the older they are. Metal turners have average figures in England, and favorable ones in Paris.

Textile workers, and industries exposing to organic waste.—Regarding these no general rule can be stated.

Occupations carried on in confined places.—The figures here are average or moderate. Tailors and shoemakers in Paris have moderate figures. No special note is made for domestics or shopkeepers.

Learned professions.—So far as Bright's disease is concerned, these lose their ordinary advantage. Teachers, to be sure, are little subject to it, but clergymen have average figures. Lawyers the same; doctors and druggists, high rates, and this we find also among the Paris doctors.

Occupations carried on in the open air.—All of these occupations which involve exercise are remarkably free from Bright's disease; ordinary seamen are the exception, their rates being high. Commercial travelers also have average rates.

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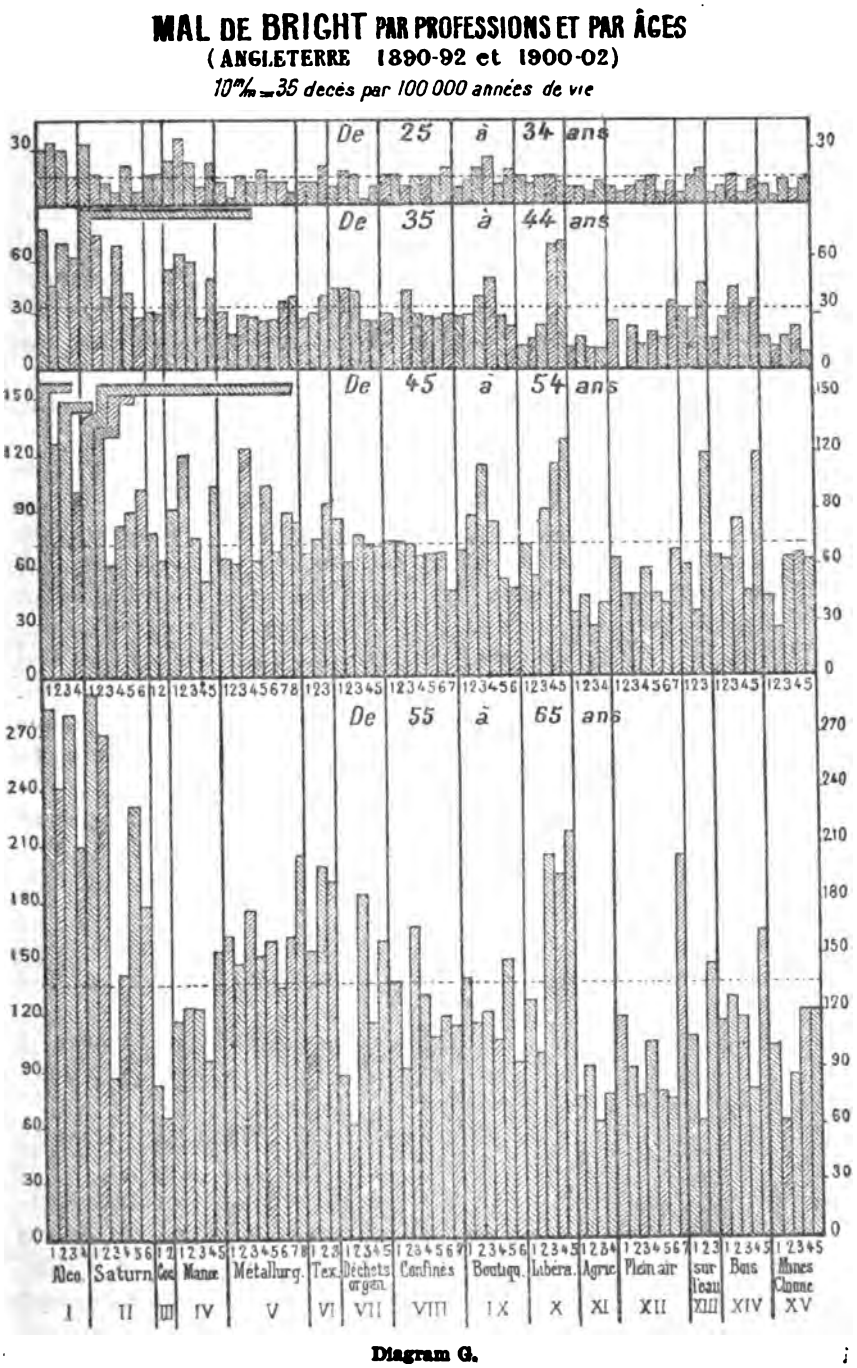

Diagram G.

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Industries engaged in woodwork.—The figures are rather favorable.

Miners.—Bright's disease is very rare among coal and iron miners and quarrymen.

Chemical industries.—The figures are quite favorable for all industries of this group (except perhaps workers on rubber).

DISEASES OF THE NERVOUS SYSTEM.

Much the most common disease of this group is cerebral hemorrhage. Other diseases of the nervous system, such as general paralysis, epilepsy, and diseases of the spinal cord, are too infrequent to affect the figures materially.

The occupational groups most subject to these diseases are the following:

1. First of all are innkeepers. Brewers are exposed to it also, but much less so. Malsters have very favorable figures.

2. Occupations most exposed to lead poisoning (especially file makers, who have very high figures at all ages above 35); although the general tables for this group are just average. Painters, glass manufacturers, and in some degree potters and glass blowers (the last three occupations at ages only above 45). On the other hand, printers show favorable figures.

3. Peddlers and day laborers have high rates, while coachmen and hackmen, although often alcoholic, have favorable rates at all ages. Street railway employees, and especially domestic coachmen, have still more favorable figures. Dock laborers, who are very prone to alcoholism, have only average or low figures.

4. Textile workers have high mortality at ages above 55; dyers at earlier ages also.

5. Butchers, among whom alcoholism is frequent, have average figures, especially at the ages 55 to 64.

6. Doctors and druggists have always a very high rate and lawyers have figures corresponding to the usual average; while clergymen and teachers keep their usual advantage.

7. Seamen have average or high rates, especially under 35 years of age. In the same way fishermen have high rates up to the age of 35. Those of bargemen are average.

For other occupations the difference is not marked until after 55 years of age.

On the contrary, diseases of the nervous system (cerebral hemorrhage) are of average frequency among metal workers. They are uncommon among clerks and of average frequency in other sedentary occupations. They are very uncommon among farmers, and uncommon in most occupations carried on in the open air (except the three pursued on the water).

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MALADIES DU SYSTÈME NERVEUX

10 m/m = 125 décès

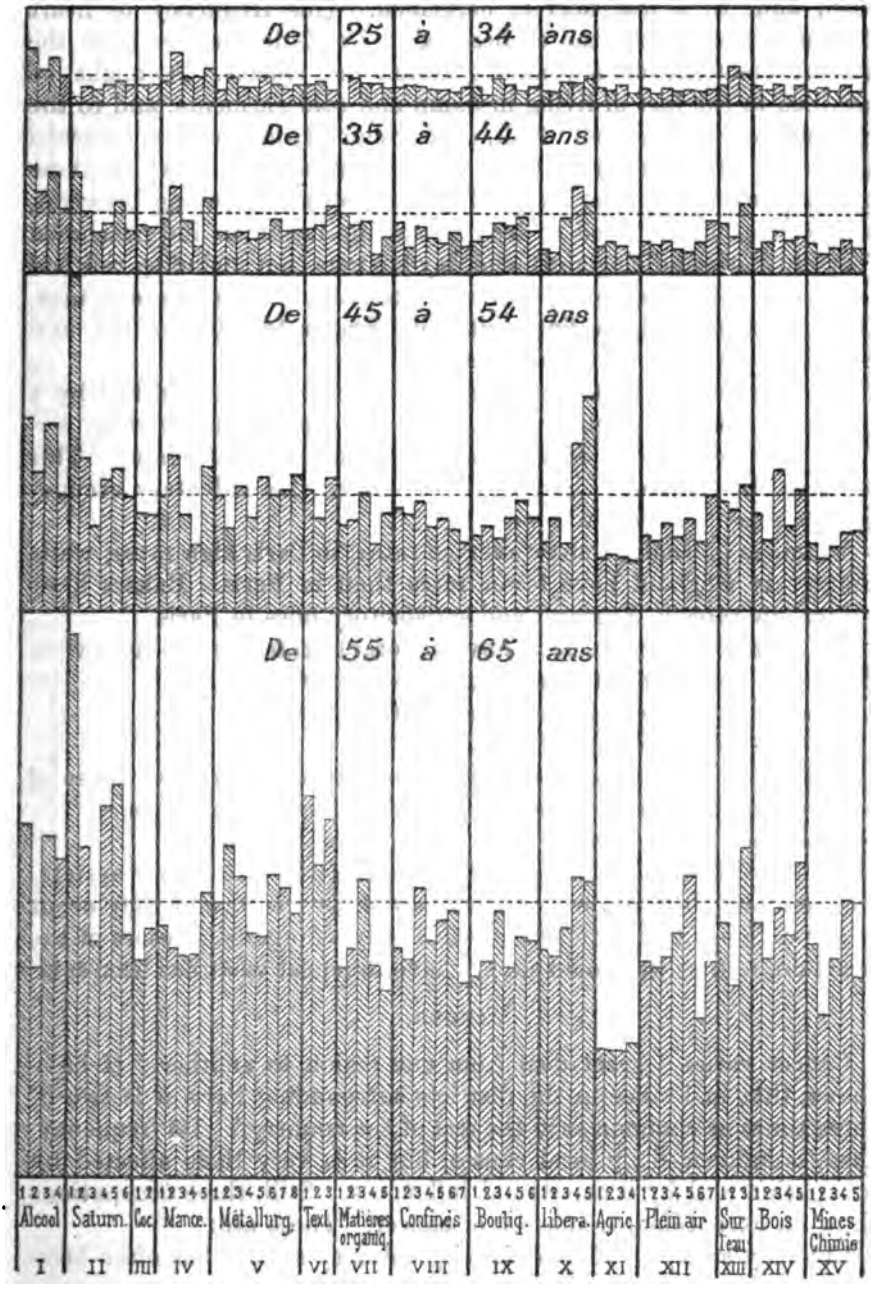
De 25 à 34 ans
De 35 à 44 ans
De 45 à 54 ans
De 55 à 65 ans
1 2 3 4 Alcool I
1 2 3 4 5 6 Saturn. II
1 2 Coc. III
1 2 3 4 5 Manoe. IV
1 2 3 4 5 6 7 8 Métallurg. V
1 2 3 Text. VI
1 2 3 4 5 Matières organiq. VII
1 2 3 4 5 6 7 Confinés VIII
1 2 3 4 5 6 Boutiq. IX
1 2 3 4 5 Libera. X
1 2 3 4 Agric. XI
1 2 3 4 5 6 7 Plein air XII
1 2 3 Sur Teau XIII
1 2 3 4 5 Bois XIV
1 2 3 4 5 Mines Chimie XV

Diagram H.

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ORGANIC DISEASES OF THE HEART.

Of all occupations those in which diseases of the heart most often cause death are the three carried on upon the water—sailors, fishermen, and, to a less degree, bargemen. This frequency of heart disease appears from the earliest age. Dr. Ogle ascribes it to the violent emotions caused among sailors by storms. It might be ascribed to the fact of living in damp and cold garments, and to the rheumatism thus caused. Still, acute rheumatism is seldom returned as the cause of death in these three occupations. Next to these occupations come those exposed to alcoholism (including brewers), the occupations exposed to lead poisoning, hackmen and coachmen (both in Paris and England), and day laborers (not including railroad laborers). Metal workers, except locksmiths, have average figures. On the other hand, we find quite high figures for blacksmiths, and especially for cutlers and tool makers.

In the group of textile workers, the dyers are distinguished by a high mortality (connected with that of the chemical industries).

Hair dressers above 35 years of age have high death rates. This appears also in Paris. Perhaps they entered this sedentary occupation because the heart was weak.

Butchers in England show average rates; in Paris high rates; while tanners in England have lower rates than in Paris. Bakers have rather low rates in England and satisfactory ones in Paris.

All sedentary occupations have favorable rates at the age when heart diseases are most common, namely, above 55.

Learned professions have average rates.

Farmers keep their usual advantage.

Industrial occupations carried on in the open air, like those of masons, shipbuilders, railway mechanics, have average rates.

The same is true of workers in wood and of miners.

I do not dwell upon the other diseases of the circulatory system. In the main, these are organic diseases of the heart, and they occur in the different occupations almost exactly as organic diseases of the heart do, so that we should simply have to repeat what has been said.

CANCER.

Cancer varies a great deal from one region to another. (I have shown that in France in the districts surrounding Paris it is two or three times as common as in the rest of the country.) Its frequency, then, is influenced by local causes, but it is very little affected by occupation and by occupational influences. Still, three occupations show an exceptional frequency of cancer. These are:

Chimney sweeps. (Cancer among chimney sweeps has often been mentioned and described.)

Brewers.

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MALADIES ORGANIQUES DU CŒUR PAR PROFESSIONS ET PAR ÂGES

(ANGLETERRE 1890-92 et 1900-02)

10 m/m = 37 décès par 100.000 années de vie

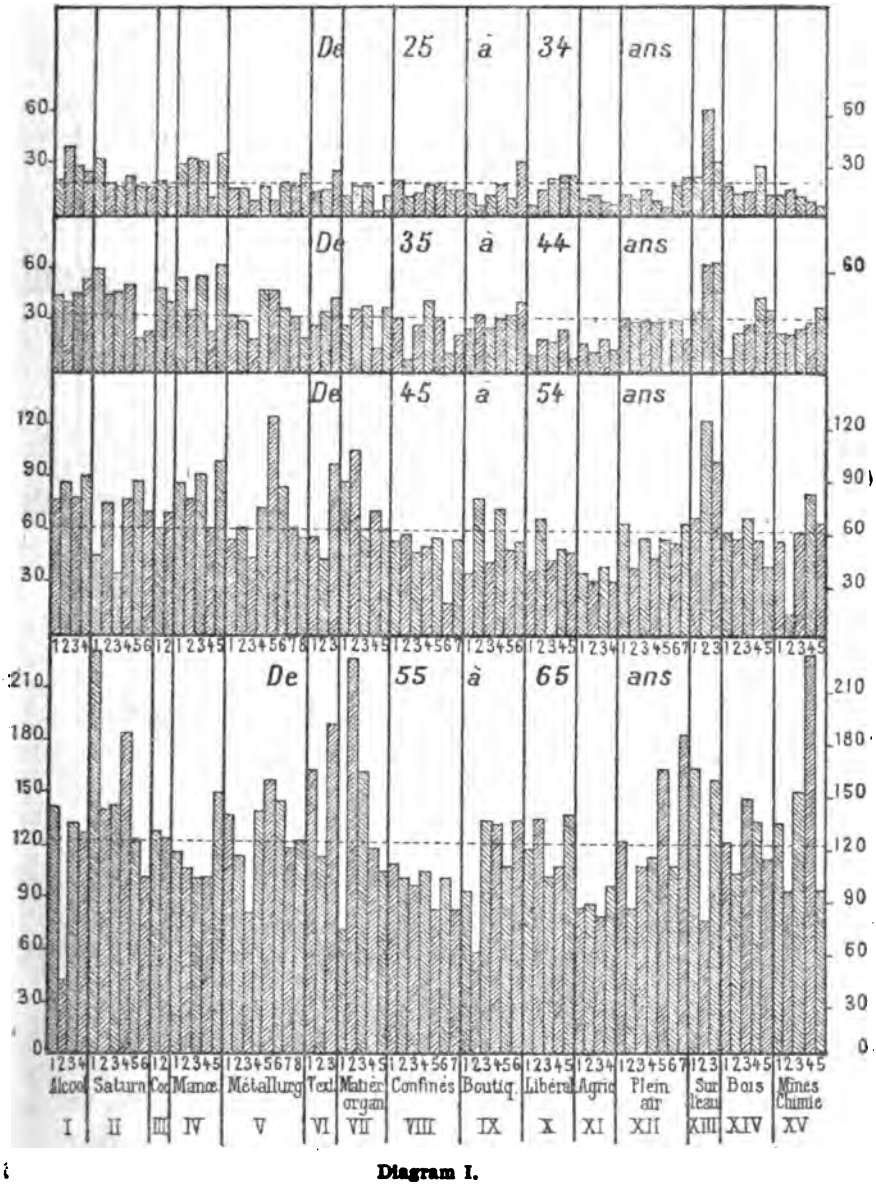

Diagram I.

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Seamen (while bargemen and fishermen have average figures).

In other occupations the figures are about average.

These different results appear to be constant. They are found in the four age periods after 25 and in each of the two periods studied.

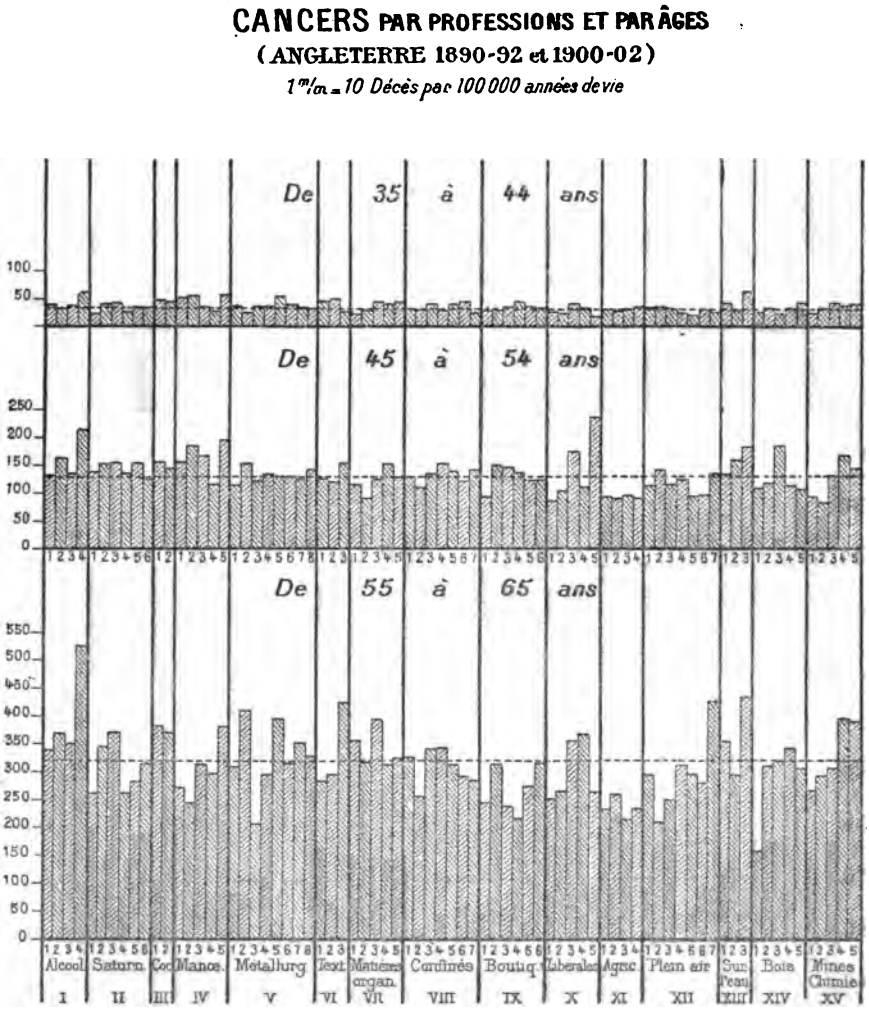

Diagram K.

I can not attempt to explain the comparative infrequency of cancer in country districts which has been shown to hold for France, Germany, and Italy.

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ACCIDENTS.

Occupations in which death by accident is most common are, above all, those carried on upon the water—bargemen, fishermen, and seamen. Far below these three occupations are railway workmen and miners; then come dockmen and coachmen.

Fatal accidents are much less frequent in all other occupations.

The age factor, so important in all other causes of death, plays only a subordinate rôle in deaths by accident. Their frequency is almost the same throughout life, still it increases noticeably with age in the case of hackmen and dockmen; perhaps the decrease of muscular strength is the cause; more probably it should be attributed to alcoholism, the effects of which naturally increase with age.

On the other hand, the frequency of accidents decreases with age among railway workmen, and especially among workers on locomotives. Up to the age of 45 years, at least, it would seem as if experience made them careful. The death rate from accidents always increases after the age of 55 years.

SUICIDE.

As might be expected, there is a relation between the frequency of alcoholism in an occupation and that of suicide. Still we shall see that other factors influence the frequency of suicide.

Those occupations in which suicide is most frequent are, above all, those involving the use of distilled liquor. Brewers have lower rates.

Occupations exposed to lead poisoning.—While these are but little subject to alcoholism, file makers, potters, and glass makers are prone to suicide. The same is true of Parisian plumbers. In England painters and plumbers show average rates. Printers, who are but little subject to lead poisoning in England, have quite favorable rates. Drivers have average rates. Coachmen have rates a little higher.

Although very subject to alcoholism, dock laborers have rates below the average. The same is true of porters and day laborers. Peddlers have a rate a little above the average. Railway laborers have low rates.

Metal workers.—Though these occupations are moderately given to alcoholism, suicide is usually quite frequent.

Textile workers.—The same is true of nearly all textile workers.

Occupations exposing one to organic waste.—Suicide is very common among hatters, hair dressers, butchers (three occupations addicted to alcoholism). It is less common with millers and bakers (and these are little addicted to alcoholism).

Occupations carried on in confined places.—Commercial clerks, though temperate, commit suicide quite often, but railway employees

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ACCIDENTS PAR PROFESSIONS ET PAR ÂGES
(ANGLETERRE 1890-92 et 1900-02)
1^m/m 10 décès par 100 000 années de vie

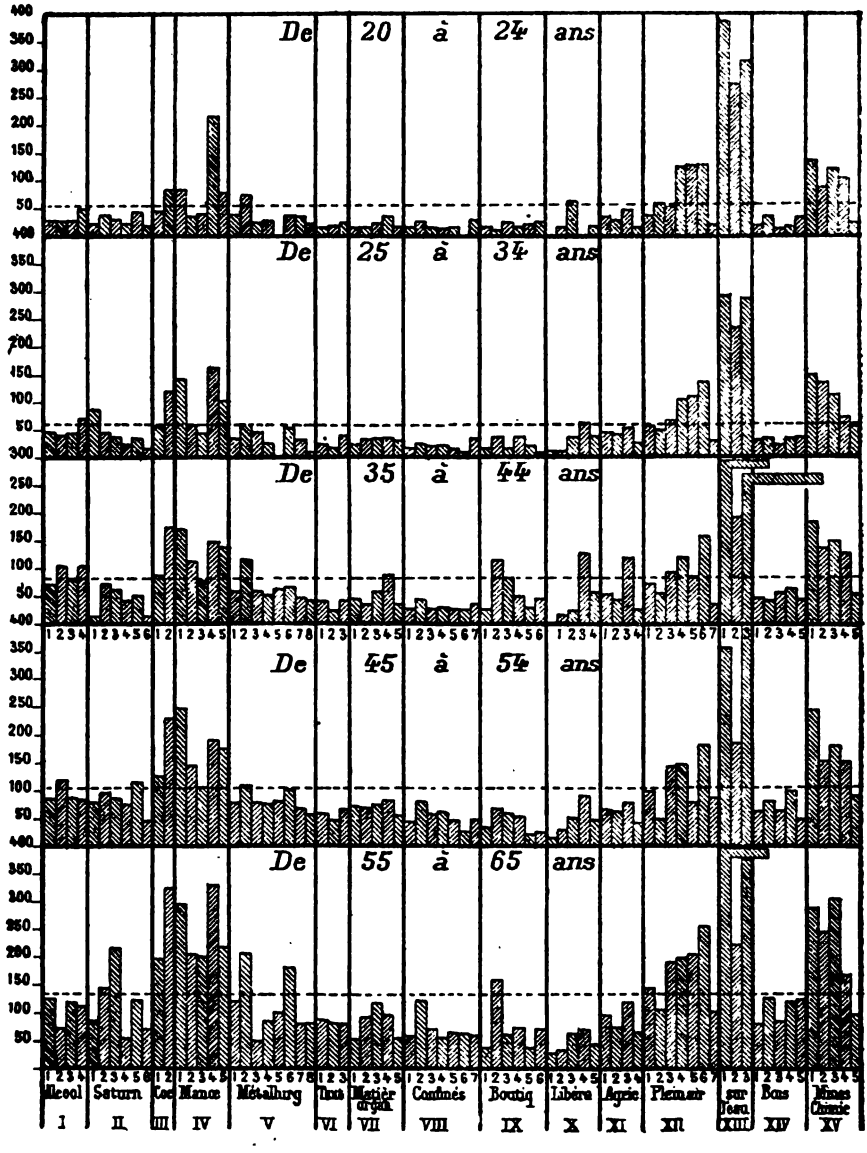

Diagram L.

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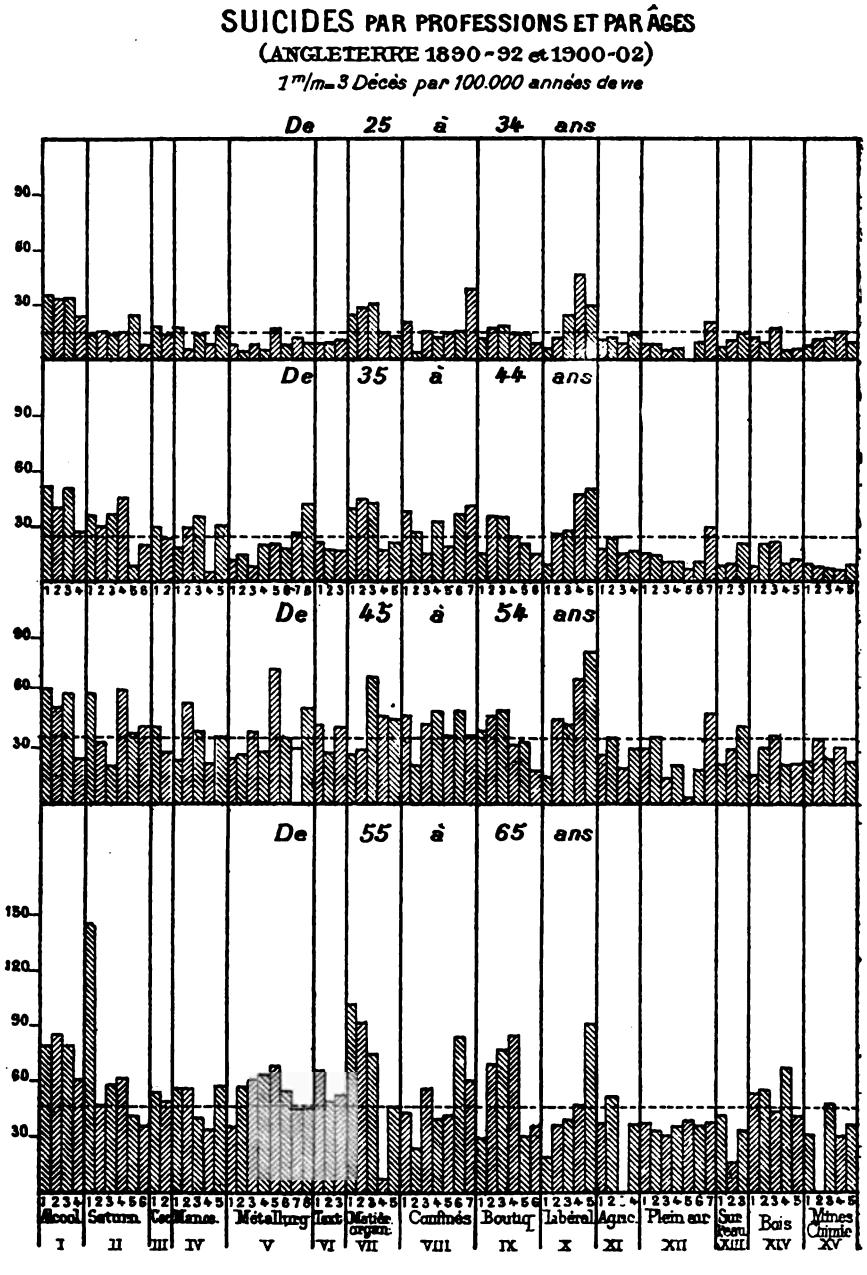

Diagram M.

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infrequently. Among shopkeepers suicide is common (perhaps the fear of business failure is a factor). Still, suicide is uncommon with grocers.

Learned professions.—As might be expected, suicide is very uncommon among clergymen. It is uncommon with public officials and, in Paris, with post-office employees.

In the other learned professions it is more common than the average; a little more frequent with teachers and lawyers, and much more frequent with druggists and pharmacists. The last is the profession in which suicide is most common.

Among English doctors suicide is very common, but among Parisian doctors very uncommon.

Occupations carried on in the open air and with much exercise.—Suicide is uncommon among farmers (still, it has an average frequency among farm tenants).

It is very rare in the industrial occupations of this group, such as those of masons, tile makers, shipbuilders, engineers, and railway workers; it is uncommon with bargemen and fishermen, but of average frequency with seamen, and quite common with commercial travelers.

Woodworkers.—Suicide is of average frequency with wood turners and coopers. In the other occupations of this group it rises to or above the average only after the age of 55. (In Paris carpenters of more than 45 years of age have a high rate.)

Miners.—Among them suicide is rare, especially with the coal miners.

Chemical industries.—Suicide is rare among the makers of chemical products and yet more rare among gas makers.

DIABETES.

I have described the most prevalent causes of death. It is impossible to study subordinate causes. Still I make an exception in the case of diabetes.

This disease is very common in the following occupational groups:

1. In the learned professions, especially among lawyers and doctors. Pharmacists and clergymen have lower, though high rates. Lastly, teachers, architects, and musicians have average rates.

2. Occupations exposed to alcoholism; innkeepers, brewers, and malsters.

3. Butchers.

4. Certain other professions (dyers, commercial travelers, commercial clerks, railway clerks).

On the other hand, diabetes is very uncommon in the following occupational groups:

1. Coachmen and drivers, notwithstanding they are proverbial drunkards.

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2. Hand laborers of all kinds, such as dock laborers, porters, general laborers, although drunkenness is very common among them.

3. Railway workmen (workers on the roadbed, guards, porters), but railway clerks and also engineers and firemen rise to or above the average.

DIABÈTE
10 m/m = 39 décès
De 35 à 44 ans
De 45 à 54 ans
De 55 à 65 ans
1 2 3 4 Alcool
1 2 3 4 5 6 Saturn.
1 2 Voc.
1 2 3 4 5 Manoe.
1 2 3 4 5 6 7 8 Métallurg.
1 2 3 Text.
1 2 3 4 5 Matières organiq.
1 2 3 4 5 6 7 Confinés
1 2 3 4 5 6 Boutiq.
1 2 3 4 5 Libéra.
1 2 3 4 Agric.
1 2 3 4 5 6 7 Plein air
1 2 3 Sur Trans.
1 2 3 4 5 Bois
1 2 3 4 5 Mines Chimie
I II III IV V VI VII VIII IX X XI XII XIII XIV XV

Diagram N.

4. Persons engaged in agriculture (except farm tenants, who are ess favored than domestic servants on the farm), gardeners and farm laborers.

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5. Several other manual occupations carried on in the open air (masons, shipbuilders).

6. Miners and quarrymen (except lead miners).

We find only average or insignificant figures in the metal-working and textile industries, sedentary occupations, and those pursued on the water.

Now I pass from a study of the several causes of death by occupations to a study of the total occupational mortality, comparing the results reached in six different tables (two for Paris, one for France, two for England, and one for Switzerland). These comparisons are only approximations, for the occupations are not classified in exactly the same way in the different tables.

In diagrams O–R[2] the lighter vertical bars to the left represent the average death rate of males in the age period specified below; the black bars to the right represent the average death rate of males of the same age engaged in the same occupation. When the black bar is taller than the lighter one the mortality in the occupation is above the average mortality of males at that age and vice versa.

Innkeeper, etc. (26).—The death rate at each age is very great. All the tables agree. It has already appeared that nearly all the diseases, especially cancer, cooperate to produce this result.

Brewer (25).—The same remarks apply.

Printer (40).—The death rate at each age is very high, especially according to the two tables for Paris and the one for France. The English figures are more favorable, especially the later ones, which show progress. The Swiss figures, which are quite unfavorable, include lithographers and other artisans who do not work with type.

Plumber, painter, and glazier (64).—The death rate is very high. The English figures are not so bad as those of Paris, France, and Switzerland. Furthermore, an improvement appears in the later period.

Brickmaker, etc. (93).—The death rate is very low (contrasting with the death rate among potters, for washing the pots in a varnish with lead for a base exposes potters to lead poisoning and makes their death rate very high).

Dyer, etc. (77).—The death rate at all ages is high. (The Swiss figures are more favorable.)

Copper worker, tin worker, etc. (59).—According to the French table and the first English table the death rate at all ages is high. The later English table shows improvement. The Paris table is still more favorable.

Slater, etc. (62).—The death rate at all ages is very high, especially in Paris and France (where the slaters are very often also plumbers). The later English table shows improvement.

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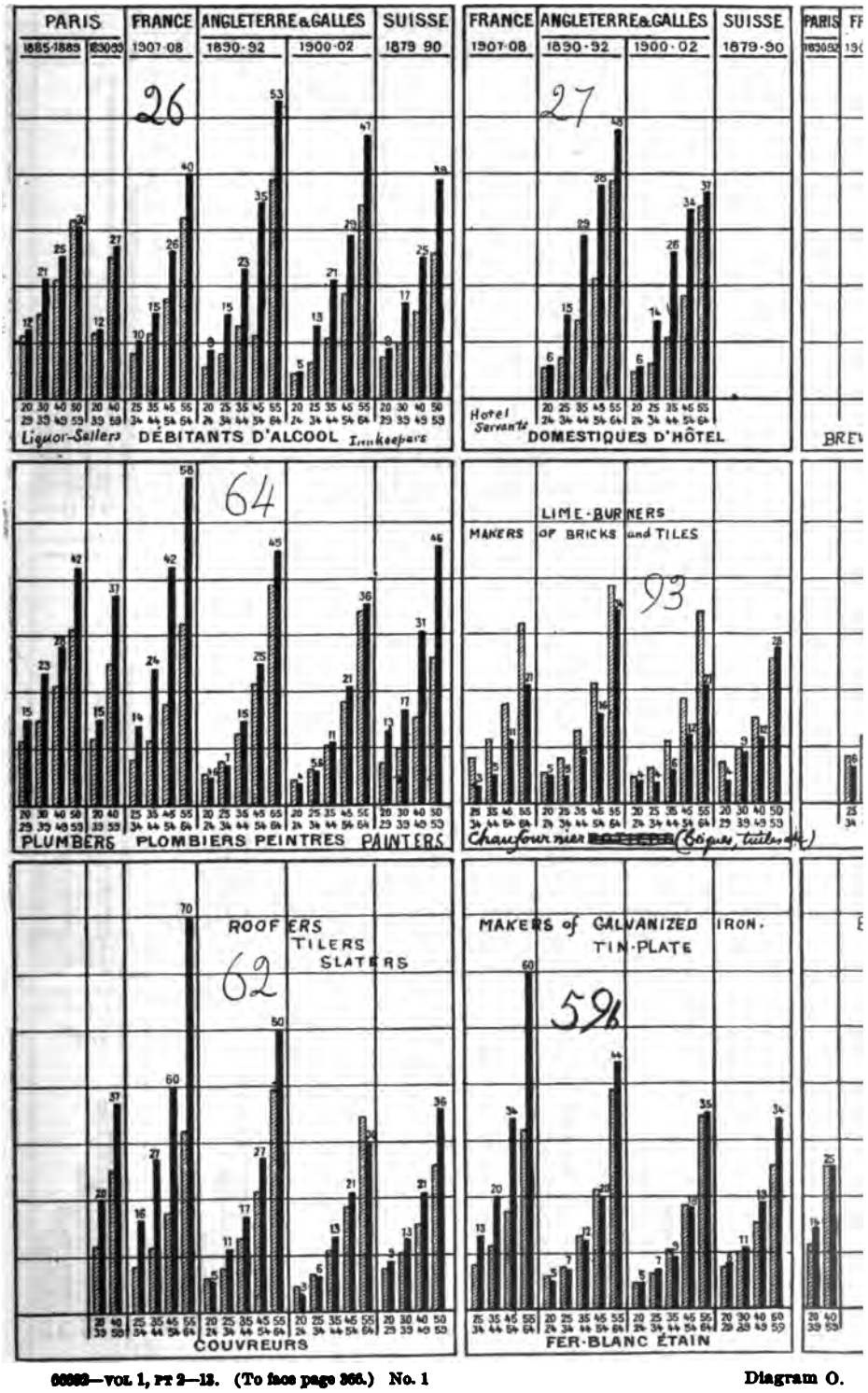

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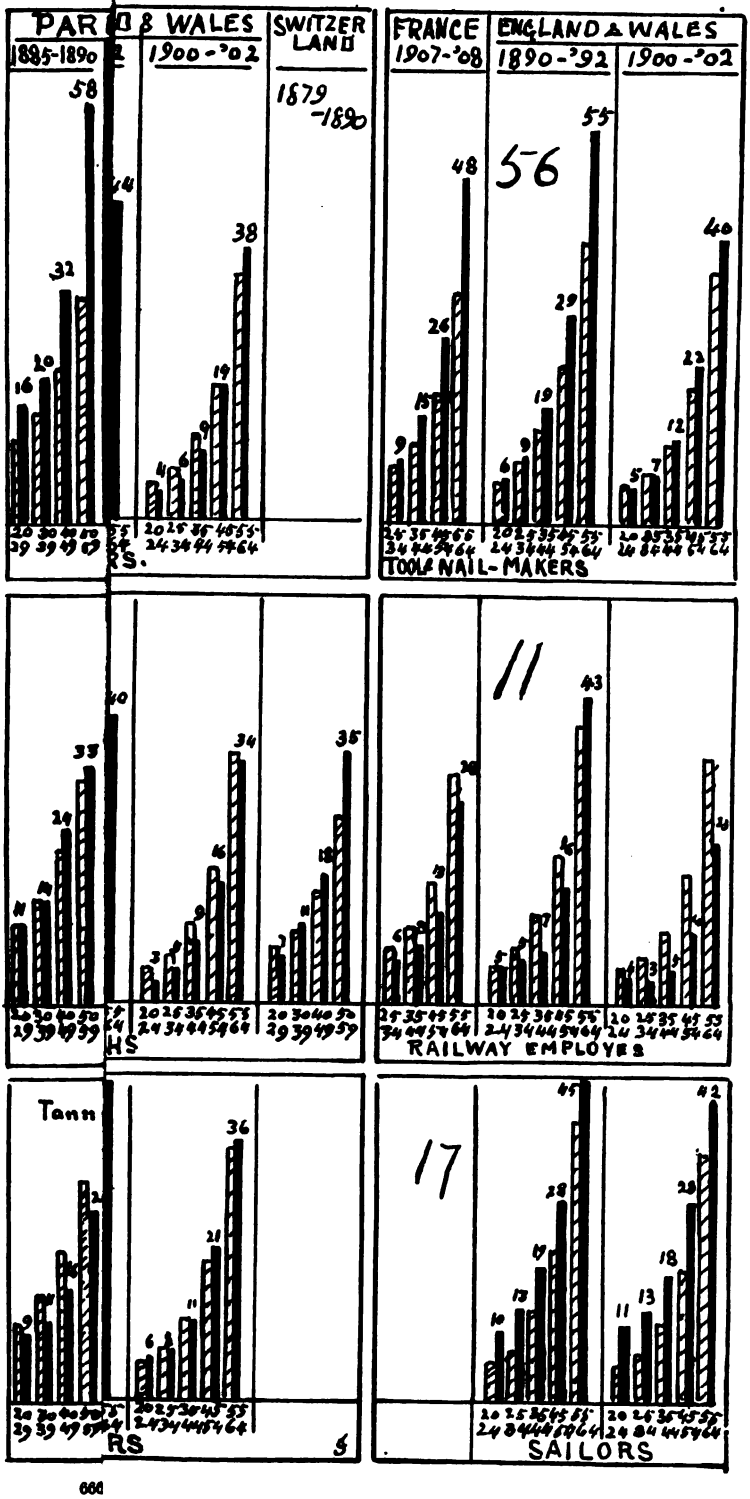

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Tin-plate manufacture, etc. (59b).—The death rate is high, especially in France. The later English table shows improvement.

Brass, bronze manufacture, etc. (59e).—The death rate is a little above the average.

Lace worker (75).—The death rate is low, especially in France. We have compared occupations which are almost the same, but not absolutely identical in the different countries.

Coachman, etc. (14).—The death rate at all ages and in all countries is high. Still, the later English figures are a little more favorable.

Boiler maker (53b).—The death rate is quite high, especially after 40 years. The earlier Paris table gives favorable figures, but in this it differs from the others.

Nail manufacture, etc. (56).—The death rate is very high, according to the two Parisian, the French, and the Swiss table. The death rate is average, according to the two English tables.

Engine, machine maker, etc. (53a).—The death rate is very high, according to the French and the early English table, and quite high according to the two Paris tables. The later English table shows a great improvement in that country. The Swiss figures give average rates.

Blacksmith (57).—The death rate is high according to all the tables; still, the later English table shows an improvement.

Railway employee (11).—The death rate at all ages is moderate.

Tanner (51).—The death rate at all ages is very low, according to the two Parisian and the two English tables. The French table shows higher rates, but it includes with the tanners the furriers, whose death rate is much higher.

Hairdresser (49).—The death rate at all ages is high.

Hatter (46).—The death rate at all ages is high, according to the two English tables. On the other hand, the two tables for Paris show low rates. This difference is only an apparent one. In Paris we are dealing, not with makers of hats, but with hat dealers, that is to say, mere storekeepers.

Seamen, etc. (17).—The death rate at all ages is very high, according to the two English tables.

Butcher (43).—The death rate in early years is moderate, and in Paris it remains so. In England, Switzerland, and especially in France, it is high. In England an improvement appears for 1900–1902.

Baker (45).—The death rate is high in Paris, France, and Switzerland. In England it is average, and, in the later period, below the average.

Miller, etc. (44).—The death rate is low until about 50 years of age; then it is average (and in Switzerland high).

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Watch or clock maker (41a).—The death rate is average.

Shoemaker (48).—The death rate is quite high in Paris and France, but average in England and Switzerland.

Tailor (47).—Almost everywhere the death rate is a little above the average.

Commercial clerk (10).—The death rate in Paris, France, and Switzerland is high; in England it is low.

Bookbinder (39).—The death rate is high in early years (indicating that the occupation draws upon a poor stock); later, average or below the average.

Clergyman (1)—The death rate is very low, especially in England.

Teacher (5).—The same remark holds.

Postal and telegraph employee.—The death rate is low, especially in Paris and England. (The classification in England (100) is a little different.)

Physician, etc. (4).—The death rate in Paris is very low; but rises to and above the average in France, England, and Switzerland.

Lawyer, etc. (2).—The death rate at all ages is very low, except in Switzerland, where it is reported as very high. (The classification is a little different. In Switzerland it includes notaries and other persons performing clerical service.)

Fruiterer (33).—The death rate is a little below the average.

Coal merchant (36).—The death rate is very low.

Stone worker (60).—The death rate is above the average, which is due, at least in part, to the fact that two occupations are included together. Stone workers have a much higher death rate than masons, because tuberculosis is extremely common among them. I attribute this to the fact that they breathe mineral dust. Stone workers should not be included with masons, as is done by the English statistics, but with workers in the ground, as the French statistics do.

Gamekeeper (102).—The death rate is extremely low.

Commercial traveler (9).—The death rate in youth is low; then, according to the English statistics, it becomes average, and according to the French statistics, it becomes very high.

Carpenter (61).—The death rate is above the average, according to the Parisian, French, and Swiss figures. On the other hand, according to the two English tables, it is low.

Sawyer (66).—The death rate is very low.

Road laborer, etc. (92).—The death rate in France is low, in Switzerland average, and in England it has fallen very much.

Coal miner (83).—The death rate is low until about 50 years is reached, and then it is high.

Stone or slate quarrier (89).—The death rate at all ages is high, resembling that of workers on stone. The later English table shows better results.

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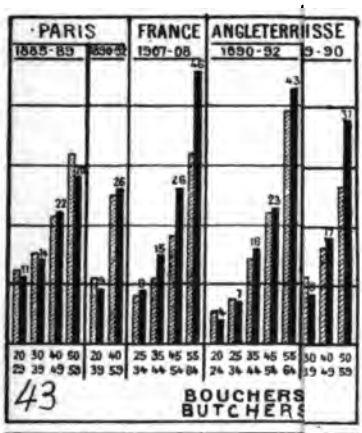

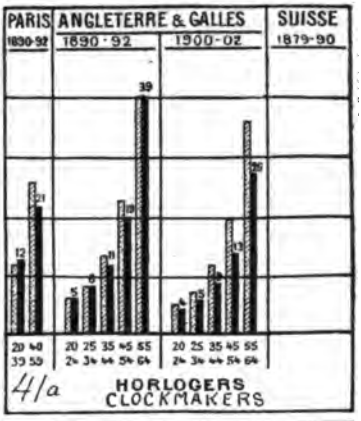

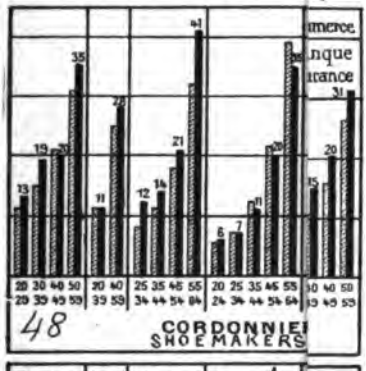

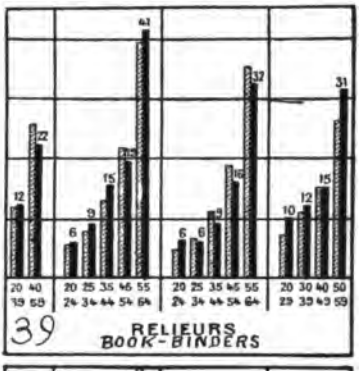

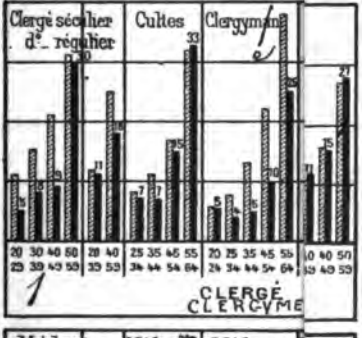

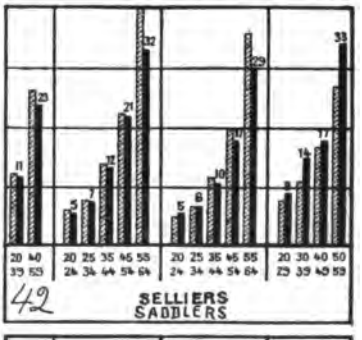

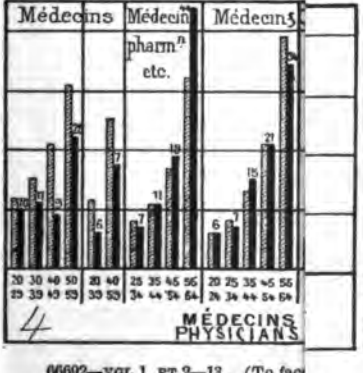

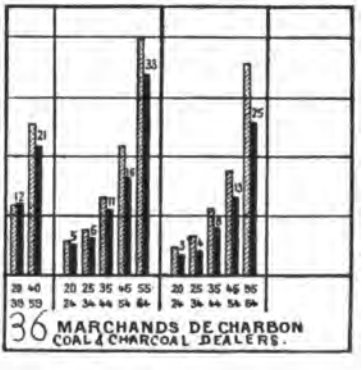

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Wood turner, cooper (67).—The death rate is high or very high. (On the other hand, the earlier Parisian table shows low rates.)

Wheelwright (69).—The death rate at all ages is low, with the exception of that shown by the French table.

Architect, etc. (6).—The death rate is low. According to the Swiss table it is average, but this is because the table confuses architects with contractors.

Chemist, druggist (29).—The death rate is very low, according to the two Paris tables, and average, according to the two English tables.

Farm laborer, etc. (21).—The death rate is very low.

Persons engaged in chemical manufacture (71).—The death rate, which formerly was high in England, decreased notably in 1900–1902.

Makers of tallow, soap, manure, etc. (50).—Same comment.

GENERAL SUMMARY.

We may sum up, then, the results of the present study in the following propositions:

The occupations in which the death rate is highest are those in which the workman is exposed to a poison, either alcohol or lead.

Several occupations with a high death rate are characterized by exposure to hard dust, mineral or animal. Exposure to soft dust does not result in a high mortality.

The occupations in which man is exposed to inclement weather while unable to exercise have a high mortality. On the other hand, occupations carried on in the open air, when they do not keep a person quiet, are very favorable to health. This is especially true of agricultural work.

Occupations in which the workman is supervised, that is to say, watched over and compelled to follow a regular and sober life, have a death rate very much lower than occupations similar in all other respects, but not thus supervised.

The learned professions generally show a low death rate, still doctors (especially in Paris) have an average rate.

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[1] Leclerc de Pulligny: Hygiène Industrielle (1908).

[2] These relate to males in 55 different occupations. The figure above each vertical black bar shows the annual number of deaths in each 1,000 persons of the specified age engaged in the specified occupation. I could not arrange the occupations in the same order as in Diagrams A–N. But this is unimportant since the name of each occupation is given on the diagrams. The number on the face of the diagram is the number of the occupation in the Registrar-General's list.

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WORKINGMEN'S INSURANCE IN GERMANY: ITS SOCIAL HYGIENIC AND POLITICO-SOCIAL IMPORTANCE.

Ministerialrat Dr. FRIEDRICH ZAHN, Director of the Bavarian Royal Statistical Office, Munich, Germany.

INTRODUCTION.

The people and the people's strength are the most valuable possession of a nation; not a mere mass, not a negligible quantity, but organic national capital which, in a wide sense, represents the primary source of civilization and of economic productivity. This is true both for the Governments of the Old World and for those of the New, with their swelling tide of immigration. Especially does this hold at the present time, when, in view of the steadily advancing industrialism and urbanization of the people, the individual is becoming more and more a source of production, a source of increased material worth, and in consequence is esteemed more and more highly.

The wealth of the nation accordingly is now measured in the main by the quantitative bulk and the qualitative maturity of its population. The utilization and the increase of national strength ought not to be accomplished by processes of exploitation; it should be capitalized in organic fashion; its newly created values must be produced out of the present stores without encroachment upon their amount or worth, just as simple and compound interest are produced out of principal.

It is evident, then, that all modern far-sighted national policy is directed not so much toward securing greater money reserves as toward securing greater human reserves; it is striving for the largest reserves of bodily and mental energy, of physical and moral health.

The attainment of this end is the task alike of social hygiene and of social politics. In the most diverse manner this task is recognized and pursued by the several countries. A particularly characteristic example is seen in workingmen's insurance, as practiced for more than 25 years in Germany, and in later times adopted by a number of other countries. When viewed from the standpoint of hygiene and of politics in the wider sense, the experience with this attempt at a solution of the problem is especially worthy of attention.

It is with pleasure, ladies and gentlemen, that I respond to the invitation of the committee of the congress and lay before you the significance, at once hygienic and political, of our national plan of workingmen's insurance. I can of course give only a résumé. Any further information which may be desired by those interested in this work will be found in the literature which has been provided, and which, with myself, I place at your disposal. At this point I wish particularly to refer to a publication, some copies of which I have

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distributed. (Sonderbeilage zum Reich-Arbeitsblatt, 1912, Nr. 9.) These the Royal Insurance Office and the Imperial Statistical Office have donated for the purposes of this address. This pamphlet gives an outline of "Social Insurance in Europe, according to the Present Condition of Legislation in Various Countries," and presents (p. 16) the main figures concerning workingmen's insurance in Germany.

I. The foundation for German workingmen's insurance was laid by the proclamation of Emperor William I, dated November 17, 1881. In this a program of the new social politics was outlined, which would assure the workers a legal claim to care in case of sickness, accident, invalidism, and old age, and protect them from dependence upon poor relief. As a means for the solution of this problem a system of compulsory insurance administered by societies organized for the purpose was announced.

This social political program was the result of a historical necessity, all former attempts upon the part of private, cooperative, trades-union, and public-protective societies having been found insufficient for the care of the working classes. But, in the face of opposition from numerous adherents of pure individualism or the doctrine of *laisser faire*, the statesmanlike initiative of Prince Bismarck was needed to establish the socio-ethical principle involved in the success of a system of insurance resting upon a basis of compulsory administration and owing its existence as much to the cooperation of the employer and the employed as to aid from the State.

Thus, in the light of existing conditions and of the prevalence of a widespread theory, the proclamation of 1881 stands as a social fact. But a clear idea of its full significance is to be had only through a realization of the great social edifice which has been erected in Germany upon the groundwork laid down by that proclamation and through an acquaintance with the enduring influence of this gigantic structure upon the whole range of international social policy.

On December 1, 1884, the law regulating insurance against sickness, on October 1, 1885, the law regulating accident insurance, and on January 1, 1891, the laws regulating disability and old-age insurance went into effect. Since then they have been improved and enlarged by supplementary ordinances and, particularly, by the Imperial Insurance Act of 1911.

Workingmen's insurance, as thus constituted, represents a scheme of compulsory insurance operated under imperial supervision. But it in nowise partakes of the character of State socialism, a point often overlooked by foreigners. It depends rather upon a healthful mingling of compulsion and freedom, of State help, and self-help, for it prescribes a far-reaching control by the employers and employees themselves through their own regulations and organizations.

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The root idea of this enactment is expressed in the provision that the economic risk of illness, accident, and the like, to which the working class is exposed and which the individual can not bear, is borne by the group. The individual is freed from the danger of loss of earnings and made to feel secure through the cooperation of the group compensating him for his misfortune in accordance with the principle "All for one."

At present, of the 16,000,000 of persons in round numbers who constitute the German working class, 14,000,000 are insured against illness, 24,200,000 are insured against accident,[1] 15,700,000 are insured against disability and old age.

A legal claim to assistance in case of need is the common possession of them all. It is expected that the number of the insured will soon be considerably increased, since, under the Imperial Insurance Law of 1911, larger groups have been given protection against sickness, and, through the Law of Insurance for Officials, a greater number of middle-grade officials, clerks, teachers, and so forth, have been admitted to the benefits of disability and old-age insurance.

II. Now, what has workingmen's insurance accomplished in the interest of the physical well-being and general efficiency of the population?

The results attained concern those who have actually come to want, as well as those who are in dread of want. They affect not only the insured, but also their families. Through the medium of the insured they benefit the whole mass of the uninsured population.

As has already been shown, practically the whole of the German working class is insured against illness, accident, disability, and old age. This fact is of hygienic importance, because of its psychic effect upon that class. They no longer look forward with dread or moody resignation to times of need; rather may they regard themselves as essentially provided for against such contingencies. Their self-respect is further fortified by an ethical element, arising from a consciousness that the assistance upon which they rely is not theirs by patronage—through motives of charity and mercy—but by a well-earned right. Thanks to this legislative guaranty, the insured need not concern themselves otherwise in order to assure their existence in time of need. In cases where their own resources also are exercised to this end, they secure the advantage and comfort of still better care for the future. It is particularly deserving of note that workingmen's insurance, unlike insurance by labor organizations or private insurance companies, is by no means confined to the upper class of workers. On the contrary, it extends through the great mass of wage earners and in that way includes no small part of the former recipients of poor relief.

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Along with these mental advantages of workingmen's insurance we should consider at the start the material benefits it has secured. From 1885 to 1910; that is, during 26 years, about 100,000,000 sick persons, victims of accidents and disability, with their families, were indemnified by the system of workingmen's insurance. The amount of this compensation ran up to not less than $2,100,000,000. The sick benefits totaled more than $1,000,000,000, the payments for accidents, $500,000,000, and those for invalidity (since 1891), more than $500,000,000. Five hundred thousand dollars each day allotted for the care of our workers! More eloquently than words these figures express the monumental social results of workingmen's insurance, and what immense expenditures have been made under it to better the economic and hygienic conditions of the working classes.

A clearer conception of it will be gained, however, by a closer examination of the various branches of the system.

III. With reference to sick insurance the following characteristics deserve to be mentioned. From 1885 to 1910 a total of 85,700,000 sick cases (including cases of disability) were helped from the funds set aside for that purpose. During this period either sick benefits or hospital treatment were given for 1,552,000,000 days of illness. In the same period more than $17,000,000 were expended for the care of women in pregnancy and childbirth. The outlay for medical attendance, medicines, and other remedial agents amounted to $373,000,000 ($219,000,000 for medical services and $154,000,000 for medicines). To these sums are to be added the expenditures for board and nursing at home and in hospital, for care during convalescence, and for funeral charges. When all these expenditures are combined, the whole disbursement for the care of the sick in the 26 years foots up to nearly $1,000,000,000, only two-thirds of which is contributed by the insured workingmen, while the other one-third is paid by the employers.

But the advantages from sick insurance by no means end here. At times when the strength of the worker is not sufficient for the support of his family, the payments in the form of sick benefits often relieve him from the necessity of soliciting inadequate poor relief. They prevent him and his family from suffering want, his diminished strength from being still further impaired by insufficient food, more sickness for him and his family from following as a consequence of their poverty. Thanks to workingmen's insurance, a common incident of such cases elsewhere does not appear in Germany; illness in a worker's family never leads to its degeneration and destruction.

The expenditures for medical treatment ($219,000,000), as well as the total outlay for the sick ($1,000,000,000), show how widespread

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is the public and private medical care of the working population. This is not merely treatment by general practitioners; there is frequent recourse to the counsel and service of specialists. In numberless cases of diseases of the eye, ear, nose, and genitals, the principle of a rational care of the sick renders it advisable to submit the patient to special treatment. Further, the modern forms of treatment by means of medical gymnastics and various kinds of electrical appliances are employed to a degree which, without the help afforded by workingmen's insurance, would overstrain the means of the working class.

Moreover, the increased amount of clinical material has naturally been the cause of far-reaching progress in medical practice and knowledge and has even improved the earning power of many physicians. The same is true of remedies, which are now oftener prescribed and better tested, and, further, of various methods of cure, but especially of the establishment of hospitals, which show a marked advance in number and quality.

When the new Imperial Insurance Ordinance goes into effect, still greater advantages for the well-being of the people are to be expected. The obligatory expenditures from the funds will then be much extended. In addition to paying sick benefits and hospital expenses, they will provide also for care in the home (by means of nurses, sisters, and so forth); for housekeeping funds (for the relatives of members who are in hospitals), for aid in maternity cases (and that during a period of eight weeks under a plan by which, for six weeks after confinement, weekly stipends will be paid or care in a maternity house or at home will be given); and for family aid and funeral expenses in case of death. At the same time the funds will have become capable of still greater expenditures. For instance, it is allowed and made easier for them to care for convalescents (by transfer to homes for convalescents), to furnish more liberal medical supplies, or to make an extra allowance for their cost, to engage midwives, obstetricians, and money for nursing the child (up to the twelfth week), to grant funds for pregnancy (for six weeks, in cases of incapacity for work, following childbirth), and also to give aid in maternity cases among the noninsured wives of the members.

There is no doubt that in future, through this development in sick insurance, yet greater benefits will accrue to the working class and to the strength of the people. It will be possible for the administrators of the sick funds to make expenditures in their discretion for the establishment of prophylactic measures, which are of paramount value for the further success of the war against consumption. Again, by improving the care of women in childbirth, by the continuous care of the mother, by better care of nursing children, by

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the erection of nurseries, by providing compensation for wet nurses, by securing a better milk supply, they will render important service toward rearing a sturdy generation and in carefully economizing the procreative power of mothers. Now that the birth rate is falling such a service is doubly welcome.

IV. The two other branches of the insurance system have likewise exerted a most beneficent influence upon the hygiene of the working class and of the general population. Although the payment of indemnities is their chief concern, the principle of thorough care for the sick has received with them an even wider development. The supporters of accident insurance—the occupational associations—between 1885 and 1910 paid out $12,100,000 for medical attention, medicines, and other remedial measures (exclusive of hospital treatment) for persons injured in accidents.

In order to lessen the impairment of earning power, these occupational associations often furnish the victim of an accident, instead of a fixed payment, with free medical attendance and nursing in a hospital, and support his family during this time, in order that he may get a prompt and not too brief a treatment. The expenditures for hospital treatment have cost up to this time upwards of $18,000,000.

According to the law, the expense of such a treatment, continued for 13 weeks after the accident, falls upon the occupational associations. Up to the thirteenth week the sick funds must bear the expense. But many associations undertake the care of the victim as soon as an accident occurs. They do this because they realize that the sooner a sound treatment begins (summoning a skilled surgeon, and so forth), the greater the saving of working strength. Thus, with their resources, they can effect a more thorough cure than would be accomplished with assistance given from the more limited means of the working-people's sick funds. The interest of the associations in the complete recovery of an injured member, thus lightening their own burden as payers of premiums, justifies them under certain conditions in spending large amounts for the complete restoration of a worker's earning power. In this way they help the injured worker to a rapid recovery and keep down the amount of indemnity paid to him, to the benefit of their own treasury. Between 1885 and 1910 nearly $3,000,000 were spent by the associations for this and *ad interim* care.

One phase of this plan for medical attendance under the auspices of the associations should not be overlooked—the increased skill in the treatment of accidents resulting from great numbers of well-managed cases. The number and variety of casualties thus promptly and ably handled have developed a great group of physicians skilled

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in their treatment. Great acquisitions in theoretical and practical hygiene have been made—acquisitions which have benefited not only the insured, but also the noninsured.

Almost more important than the measures for the care of victims of accident is the maintenance of a service for the prevention of injuries. This is provided by the supporters of accident insurance. Prevention has clearly become the soul of accident insurance, and rightly so. The maintenance of a laborer's strength is far better than the most ample income. The injured worker can not be paid an indemnity at all equivalent to what he would earn if he were well. A recognition of this fact has caused nearly all industrial and agricultural associations to issue directions for the prevention of accidents, which prescribe in detail trade regulations to be followed by employers and others controlling the acts of the employees. These regulations can be formulated in the light of well-developed accident statistics, showing their frequency, cause, place of occurrence, and degree of danger in the various kinds of establishments. Thus one can tell where accident insurance can intervene with prospect of success.

In enforcing these preventive measures, some industrial establishments already in operation were required to make their buildings safe from accident, and others in process of formation were compelled to erect safe structures. In such cases improved technique has materially helped. It has reduced the prevention of accidents to a special field of study. As in the case of other branches of technique, further progress in the prevention of accidents is sought in the scientific study of the problem and in the utilization of the experience gained from it as a basis for further progress. In consequence of the pains taken with earlier protective regulations, the more recent measures cause little difficulty to the industrial world. Their observance is enjoined by means of printed placards. These indicate each specific danger; underlined passages call attention to the precautions necessary in the use of machinery. Further, the employers have lately sought by means of premiums to interest their insured employees in the regulations for the prevention of accidents and in making suggestions for their improvement. But to enforce their rules for preventing accidents the occupational associations also maintain a far-reaching supervision over industries by means of officers and salaried deputies. There are 546 supervising officers of this sort. Through them the regulations are systematically explained and enforced.

The expense to the supporters of accident insurance for these preventive activities during the years 1885–1910 foots up to over $5,000,000 (over $500,000 in 1910). This sum covers only the outlays by the associations for the supervision of industrial establish-

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ments, the proclamation of preventive regulations, and so forth. A far greater amount is spent by individual employers for the prevention of accidents.

If you ask about the results of these efforts at prevention the answer is that so far they have justified themselves admirably.

Some kinds of accidents have almost ceased, or have considerably lessened in number and severity. The results of accidents have become less serious. It is true that the total number of accidents has increased. But the additions consist of minor injuries, due to more complete reporting. This is easily accounted for; the expectation of an indemnity explains the report of such cases.

There are those who, in consequence of this increase in the number of casualties reported, assert that workingmen's insurance has led to a hysterical craze for indemnities. That instances of this sort occur can not be gainsaid. But, in comparison with the other effects of workingmen's insurance, they are of little importance, and, according to statistics and medical authorities, they are no more normal attendants of the system than instances of loss by fire started by persons who are insured against fire, or those who willfully increase their loss by fire for the sake of increasing the resultant compensation. Whoever, like the American Liability Association, appeals to Friedenburg's work upon the Operation of German Workingmen's Insurance, has called a false witness; his picture of German workingmen's insurance is biased, and fills the foreground with abnormal phases, while blindly, almost morbidly, ignoring the normal. Therefore the work has been refused recognition by all experts and all objective critics of workingmen's insurance. The judicial system and the strong control exercised by the insurance agencies amply serve for the exposure of fraud and the discomfiture of greed.

All in all, accident insurance has effected a substantial betterment in the treatment of injured persons and a sensible diminution in the degree of their disability. Where once death resulted, life is now preserved. Where once deformity ensued, soundness of limb is now retained. Hundreds, yes thousands, of workers wholly or partly disabled have been restored to efficient working members of society. Instead of the burden of supporting cripples, there is the productive strength of the recovered. The restoring significance of the outlay for workingmen's insurance nowhere appears so clearly as it does in the case of accident insurance. No private casualty company is in a position to offer equal benefits in the shape of effective preventive measures and adequate certainty of payment independent of the employer. Still further hygienic advances are to be expected from the passage of the Imperial Insurance Act, since it is now possible to extend accident insurance to include occupational diseases. More-

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over, the methods of preventing accidents will be further improved and the supervision of industries more thoroughly developed. Thus it is hoped to approximate a status in which the regulations will operate effectively, even though the worker himself is careless. To use the words of K. Hartmann, President of the Senate, no one, not even a workman, can be expected at all times to perform the duties of his position with full consideration of the dangers about him.

V. The system of insurance against invalidity is in no way inferior in hygienic advantages to the system of accident insurance. Like the latter, its primary task is the payment of indemnities. As in the cases of sick benefits and compensations for accident, these payments protect the worker at times when his strength will not suffice for the support of his family from dependence on inadequate poor relief. His dependents need not want.

But invalidity insurance does not rest content with the payment of indemnities. In an endeavor to lighten the financial burden, it strives to limit, if not to abolish, the invalidity for which payments are needed. To this end its supporters concern themselves greatly with preventive measures.

These, of course, are only subsidiary expenditures. But it is directly owing to them that the agencies for invalidity insurance, being able to spend largely and having a great financial interest in prolonging the productive period of the working classes, have become the mainstay of all efforts to lift the standards of national hygiene.

The procedure in the preventive treatment, under invalidity insurance, is as follows: Where an insured person is so ill that disability and consequently a legal indemnity is to be apprehended, the insurance office institutes a course of treatment calculated to avert the occurrence of disability. In the case of a beneficiary whose condition is likely to be improved through additional attendance, a similar procedure is adopted to restore earning power.

The method of treatment is not rigidly prescribed in all respects; ordinarily it is dispatched during the office hours of the attending physician and in one or more consultations. But on the whole its essential features are prescribed. They consist in a systematic treatment in hospitals and convalescents' homes, health resorts, baths, or in the insured person's home. Especial emphasis is laid upon thorough diagnostic and therapeutic methods, on prompt beginning of treatment, on allowing ample time for a cure, on confirming the recovery by a later stay in a home for convalescents, and, finally, on the prompt return to work as an element in recovery. As a rule, persons dependent on the insured patient are granted financial support. This is an important point in prolonged chronic ailments (consumption and the like); its mental effect upon the patient is

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good, since, with that assurance, he will the more quickly resolve to enter the sanatorium and will be content to remain there as long as seems necessary.

In order that the treatment may be as successful as possible, many insurance offices have erected hospitals of their own. Since 40 per cent of the patients treated were suffering from pulmonary and laryngeal tuberculosis, these are for the most part tuberculosis hospitals. At the end of 1911, 40 such institutions and 27 homes for convalescents were maintained by the insurance offices. They also encourage the building of private hospitals by placing capital at a moderate rate of interest at the disposal of the organizers and by otherwise assisting them in the maintenance of their enterprises. Up to the close of 1911, $3,400,000 in loans had been devoted to this object, of which over $200,000 have been repaid, so that there then remained an indebtedness of less than $3,200,000.

There were then in Germany 138 hospitals for adult consumptives, with 14,079 beds; and 21 institutions for tuberculous children, with 1,352 beds. The selection of patients for the hospitals is made at 33 centers of observation and admission. Nearly all the hospitals are situated in the most attractive regions of Germany. If three months be reckoned as the average time for the treatment of a patient, then there are some 56,000 persons yearly treated at these sanatoria.

In all establishments the number of persons treated in 1911 was 123,602 (in 1900 it was 27,427), and from 1897 to 1911 it was 856,917. As stated, nearly 40 per cent of these were treated for pulmonary and laryngeal tuberculosis; but owing to the protracted course of this disease, the average expense involved in its treatment is twice the expense for treating any other bodily ill. The whole cost of invalidity insurance for treatment in 1911 was nearly $7,000,000, and from 1897–1911 over $51,000,000. These sums have been good investments, as former experiences with hospital treatment have abundantly justified themselves.

The hospitals have exceptional advantages for the treatment of individual cases. Not only is the selection of patients who can be cured made with ever-increasing care, but the diagnosis of the disease, especially tuberculosis, as well as the method of cure (in connection with the great mass of clinical material at hand), are being perfected year by year. Thus the proportions of cases successfully treated and of those resulting in permanent cures have attained very gratifying dimensions and have recently increased. According to the statistics of the Imperial Insurance Office (Amtliche Nachrichten, 1912, und Beiheft), in the years 1905–1911 from 82 to 90 per cent of patients regularly treated for pulmonary tuberculosis were so far

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benefited that disability within a reasonable period was not to be feared. Of the persons successfully treated in 1905, 54 per cent, and of those treated in 1906, 57 per cent, were still at work at the end of the fifth year following (1910 or 1911).

The particular value of hospitals from a prophylactic standpoint is also deserving of notice. It is well known that in most cases the source of tuberculosis is the consumptive himself. He must therefore be isolated from healthy persons, especially from children. Thanks to hospital treatment, persons infected with tubercle bacilli rid themselves of these to a considerable degree, and on their return to their families are no longer a menace. They also leave the hospitals with a better knowledge of hygiene for them and theirs, which materially diminishes the danger of future infection of others and assures the protection of their own health.

In all these ways invalidity insurance has become not only the real support of the whole hospital movement in Germany, but also a hardy pioneer in the struggle against one of the chief foes of the worker's life—tuberculosis. What it has accomplished in restoring the people's strength another country will not find it easy to attain, so long as it lacks the incomparable basis which invalidity insurance supplies, so long as it lacks the aid of a social legislation which obliges both employer and employed to contribute heavily to the necessary expense. The new Imperial Insurance Ordinance and the law regarding the insurance of privately employed persons will bring still larger masses of the population under the protective system I have sketched and will increase the possibilities of a well-directed fight against tuberculosis. Among the results of the new law is a movement already afoot to organize a systematic service for protection of the middle classes against tuberculosis.

To the foregoing must be added the fact that the insurance offices have substantially lightened the financial burden of many other institutions founded to limit tuberculosis and other diseases. By way of illustration, I mention the 800 bureaus of advice and information for consumptives, the 33 departments of observation and admission to hospitals, the 99 woodland sanatoria, the 16 forest schools, with an adequate system of instruction, and the 179 homes for invalids and incurables. These owe sometimes all, sometimes a good part, of their support to the system of invalidity insurance.

The work done by the insurance offices in the fight against bad housing is also of high importance. While tuberculosis, the most frequent disease among workmen, is essentially a disease of the dwelling or of the sleeping room, still many other dangers also in the life of the worker are due to bad conditions in the home. For this reason the large sums which the insurance offices lend at a low rate of interest for the erection of workmen's homes are of great advantage.

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During the years 1891–1911 about $85,600,000 were devoted to building houses for workmen's families; about $5,000,000 to building homes for bachelors, hospices, family inns, and community houses, or a total of over $90,000,000 for workmen's homes.

I must not pass unnoticed the meritorious cooperation of the insurance offices in the war against alcoholism by setting forth the dangers of alcohol, by supporting hospitals for curing inebriates, by aiding the lodges of the Good Templar, and by curative treatment of alcoholic cases (923 inebriates were received for treatment in 1911). In this fight the administrators of the sick fund lent similar aid. The supporters of accident insurance likewise furthered the movement by means of regulations for preventing accidents, which bind the employer to discharge drunken workmen, to exclude drunkards from dangerous pursuits, to forbid workmen to bring alcoholic stimulants to the places of employment or to purchase and consume them. The new Imperial Insurance Ordinance likewise refers to the combat against drunkenness. According to section 120, drunkards, instead of the money payments to which they would otherwise have been entitled, receive payment in kind, such as food, clothing, and housing, in order that indemnities may not be squandered for liquor. The applications for such benefits in kind instead of in money are made by societies for the care of the poor, upon which drunkards might otherwise become a burden.

The war against venereal diseases has been earnestly waged by the insurance offices. The number of such cases admitted to treatment in 1911 amounted to 499 and in 1910 to 677.

Recognizing the importance of care for the teeth as a means of preserving health and escaping disease (indigestion, malnutrition, and so forth), a special supervision of oral conditions has been provided. Treatment is given in cases in which permanent invalidity threatens to result from a faulty bite. As a rule, the insurance office undertakes the treatment only upon condition that the insured and the sick fund of which he is a member help to defray the cost. The contribution by the insured is intended to cover the expense of restorative treatment by means of artificial teeth; the contribution made by the sick fund aims to improve bad dental conditions and consequently the general health, and therefore takes care that false teeth are not wanted merely to remove æsthetic defects. The extent of this dental treatment is now considerable. In 1911, 30,847 persons (16,630 men and 14,217 women) received treatment, at a cost of about $270,000; a part of this sum, $55,000, was appropriated by the sick fund, the community, and the insured or third persons, and the insurance offices paid $215,000.

In addition to its specific measures in the war against disease reference must be made to the effective cooperation of the system of inva-

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lidity insurance in the field of general hygiene. It gives important help toward maintaining throughout the land a constant watch over invalids, so that large areas are furnished with communal hospitals, conducted by nursing sisters or other persons skilled in the care of disease; and with articles for use by women with children, such as baby carriages and the like. During 1911 there were 2,601 cases in women's societies, hospitals, and church congregations so aided at a cost to the insurance of about $92,000. The system of invalidity insurance gave a further impetus to the general health movement by loans at low rates of interest for proper water supplies, sewer systems, public baths, pleasure grounds, slaughterhouses, and so on. From 1891 to 1911 the loans for these purposes totaled over $41,000,000.

Thus a care for the general welfare in Germany has been greatly promoted by workingmen's insurance. The many-sided and powerful improvement that welfare has shown in recent decades has been made possible by the fact that the insurance system, with its experience, its human material, and its financial strength, has aided effectively to secure it. Almost every advance in this direction has either owed its origin to a loan from some branch of the local invalidity insurance, or else has been supported by the cooperation of sick funds or the occupational unions. So these many diverse experiments could be undertaken as pioneer ventures into the new region of social hygiene and general social reform and the objects of the work, begun by social legislation, could be further pursued. Everywhere now the humanitarian doctrine, the spirit of social sensitiveness, stirred to new life by the system of workingmen's insurance, is felt as a growing, healing force with a power that without this system it never would have had.

VI. The sketch I have thus given will suffice to show how workingmen's insurance, in all its departments, has chosen as its basic problem not only the symptomatic, but likewise the causal therapy of the life of the workman. Filled with an exalted conception of the value of the workman's life and a desire to serve him by maintaining his strength rather than by any compensation for losing it, workingmen's insurance—turning away from the payment of indemnities—directs its efforts to the removal of the causes of sickness, accident, invalidity, and other physical evils, and aims at materially increasing our national capital of human power.

We may then claim as the hygienic balance in favor of German workingmen's insurance: The more rapid recovery of ability to labor among breadwinners; better health and greater power of resistance to disease among the rising generation; a comprehensive education of the masses in the principle of hygienic self-defense; in short, a considerable rise in the hygienic level of civilization among the German people.

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With these social hygienic effects we must include others of a highly important social-political nature which workingmen's insurance has secured among the working classes, the employers, and our whole population.

Owing to the brief time at my disposal I can not go into details on this point. I wish merely to refer to the discussions in my latest work, the Load of German Workingmen's Insurance (Belastung durch die deutsche Arbeitsversicherung), which I presented in the form of a report to the Permanent International Committee of Social Insurance at their last meeting in Zurich (September, 1912), and which is also to appear in an English translation in the Bulletin of the Bureau of Labor at Washington. In that work I have shown that the statements often made in America by Prof. Farnam and others concerning the relations of workingmen's insurance and the care of the poor in Germany are erroneous. It is said that German workingmen's insurance has not diminished the amount of poor relief, as was intended, and the rise in the expenditures for poor relief in Germany is held up in proof of the assertion. This claim is due to an ignorance of actual conditions. Poor relief has been diminished by workingmen's insurance. But the money thus saved has not been hoarded up; it has been expended among a wider circle of needy persons and in the shape of better kinds of relief. A statistical proof of the correctness of this view, a view which in Germany is held by every objective critic of the existing conditions, will be found in the report which I made before the section on demography of the present congress, entitled "Workingmen's Insurance and Poor Relief."

But enough of details. No wonder, ladies and gentlemen, after what has been said, that the entire result of workingmen's insurance appears not only gratifying but inspiring.

Inspiring to Germany itself! That country is moved to build up its system of insurance for workingmen still further upon the foundation laid by the Imperial Insurance Act and the establishment of insurance for other classes of employees. While in 1909, $202,000,000 were expended, now when the pensioning of widows, the extension of sick insurance, and employees' insurance have become effective, over $273,000,000 will be spent (of which the Empire will spend about $19,600,000, the employers about $133,500,000, and the employees about $120,000,000; that is, as compared with 1909, the Government will spend nearly $7,000,000 more, the employers nearly $30,000,000 more, and the employees nearly $35,000,000 more).

Inspiring also to other countries! Many of them have already introduced systems of workingmen's insurance. Great Britain and Russia are recent examples. A vigorous tendency toward the introduction of workingmen's insurance is now at work.

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It is becoming recognized that without compulsory insurance a care for the masses, as distinguished from the élite among the workers, is impossible. Private insurance companies are not in a position even approximately to attain the remedial results which governmental workingmen's insurance has achieved. The immense financial support which German workingmen's insurance can bring to bear upon its important hygienic and social duties can not be secured by private insurance systems or private beneficial societies. It is being more and more perceived that the issues at stake are far too vital to be intrusted to the management of private and uncertain schemes for their protection. It is a growing conviction that sums spent for workingmen's insurance pay handsomely when regarded as the reproductive expenses needed for the system of national industry, as a technical prerequisite of increasing economic productivity, as a national insurance premium applied in the interest of the physical, mental, and moral conservation of health and productive power.

In his notable book upon World Organization as Affected by the Nature of the Modern State, Hon. David J. Hill, who is highly esteemed in Germany as a scholar as well as a diplomat, expresses the hope that the energy of humanity may be more and more diverted from plans and preparations for mutual destruction and may be turned instead toward mutual aid in the war against vice, disease, and ignorance, the common enemies of mankind. Ladies and gentlemen, those who see how workingmen's insurance is advancing over the earth will share in this hope!

With the increasing similarity between the social politics of the different civilized countries in the way of world-wide legislation for workingmen's insurance, we gain more than a new structural element of national solidity. The previous exploitation of human labor is being succeeded by a strengthening of productive and reproductive power—by a husbandry of national vital resources, which, from the standpoint of higher civilization, is most heartily to be welcomed.

[1] Including a great number of proprietors of small establishments.

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THE NUTRITION OF THE PEOPLE.

Dr. MAX RUBNER, Professor of Physiology and Director of the Physiological Laboratory, University of Berlin, Germany.

It is a joyful thing for us all, in civilized countries, to see the general mortality more and more decreasing.

In Europe the decrease commenced about the middle of the past century, from the time when well-planned measures of public and private hygiene were initiated. With us in Germany social legislation has exerted an especially favorable influence on the health of the great masses. The stringent factory laws, the shortening of the working hours, the protection of women, children, and youthful workers, have not failed to produce blessings.

During recent decades wealth has increased in all civilized countries, and in this good fortune, as I should say especially for Germany, not only the well-to-do, but also the people of small means, have enjoyed their due share. The deposits of the savings banks grow from year to year, and many who made use of this means of small savings have advanced to investments of larger sums. The generally increasing wealth is the cause of the reduction of general mortality, which at times takes place almost by bounds. Körösi has especially shown how the mortality from infectious diseases, as well as from noncommunicable diseases, decreases in a remarkable manner with the increase of general wealth.

In the civilized countries hundreds of thousands rise every year into the healthier, well-to-do classes, and so improve their nutrition, their living conditions, and the care of their children. These facts and these successes fill us with the hope that the development of the humanitarian hygienic ideas will continue.

But it would be entirely wrong to relax our effort, for human development does not stand still, and the advances in industrial life do not always bring an increase of health. The hygienist who travels with open eyes through the old Continent of Europe will frequently see deficiencies which general statistics do not reveal. Life has not at all become a paradise yet for all people, and even among nations that can boast of a great increase of wealth there are still hundreds of thousands for whom life is hard. A reduction of general mortality is not at all proof of an improvement of the somatic qualities of a people, and yet this ought to be the final aim of all hygienic effort.

The study of the conditions of the poor shows us, in spite of the great assistance rendered by private and public humanitarian institutions, that there is room for much improvement. We frequently find instances of a poor bodily development, especially in the large cities of all countries, weakly looking individuals, with a pale color, whose

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misery is written in their faces. But beyond these narrow circles of misery we hear complaints that, in spite of the reduced mortality, the bodily strength and endurance of dwellers in large cities, and especially of factory workers, are decreasing, among adults as well as among children. Many are the causes, of course, of this reduced bodily efficiency of the inhabitants of large cities. We find them also among the better classes, where lack of exercise, professional mental exertion, and the effects of school life are rightly mentioned as causes. But among the poorer classes the causes are oftenest found in health impaired by the struggle for daily bread. The problem of the nutrition of the people is doubtless of the highest significance for the quality of a nation.

The Fourteenth International Congress on Hygiene and Demography, held at Berlin in September, 1907, considered two questions concerning the nutrition of the people, of which I published later a detailed exposition in book form (Volksernährungsfragen).

But the nutrition of the people is so important that I deem it proper to discuss it to-day from a somewhat modified viewpoint. Much has been written on nutrition of the people, especially in the daily press, but mostly by people who are laymen in questions of nutrition.

The layman is quick in his decision, even on questions which present the greatest difficulties to the specialist. Every time the price of a food product is advanced he sees before him at once "impending famine." Calamity cries, such as "starvation wages," embitter the agitation. And yet these clamors and accusations, as the specialist sees at once, are based on nothing but misleading assumptions and fallacious calculations.

If we want to really advance the cause, it can only be done by approaching the truth scientifically, and not until then can we hope for rational measures against these conditions. Many sins have been committed in the study of the nutrition of the people; for instance, in starting with the statistical conception that a normal workingman's ration might be determined, and thence proceeding to the assumption that any diet below this must mean undernutrition and starvation diet. I have already shown at the Fourteenth International Congress, in Berlin, that such a procedure is purely arbitrary. For there is no normal ration for workingmen, either with regard to the amount or the quality of the food, nor is the term "workingman" of any uniform significance.

These things are always related to the natural resources of each country. A world traveler will find strong and healthy men among widely different peoples subsisting on widely different food supplies. Just because the conditions are so complicated, only a critical study can show us the right way, through the physiology of nutrition.

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I believe we may say that the nutrition of the people has been improved in almost all countries, in so far as the danger of famine involving a whole nation seems to have passed, as is the case with civilized countries. Exceptionally, famine may yet occur in some places. I remind the reader of the not rare occurrence of general lack of food in India; of some isolated instances in Russia during recent decades, which have been described by Blauberg; of occasional famines during sieges in modern times. People are troubled in such cases, not only by the lack of food, but by a terrible increase of sickness and pestilence.

But with nations having adequate means of communication, the world commerce and exchange of food materials afford ample security as to food supplies. England commenced in 1830 to import cereals from foreign countries and depends to-day, when her agriculture produces unusually small crops, almost entirely on the import of foreign foodstuffs; and other nations are also compelled to import more or less from foreign countries. With well-organized transportation, such countries will generally be protected against want of food; perhaps in a better and safer manner than countries which depend entirely on their own products and lack means of international communication.

Defective nutrition of the masses, and its social dangers, lie in the fact that the food does not keep the body in a normal or average condition. When this bodily change is caused by insufficient means of livelihood and a real want of food, we are in the presence of evil social conditions. That such conditions exist, there is not the least doubt. Insufficient food leads to a decrease of the cells of the body, to a loss in muscle power, in consequence of which, at least in many trades, work can not be accomplished except by extraordinary effort, and by overstrain, leading to anemic conditions, to loss of spirit, to discontent, to class hatred. Insufficient food may produce wasting in infants, and in adolescents a retarded growth which can not be regained at a later period. Want of food reduces mental energy in children and renders education more difficult. The food of the undernourished is also in many cases poor tasting food, or inferior or partly spoiled food.

Undernourishment shows its effects especially in regions where the climate is severe and the products of the soil are scanty, rarely in regions where the products of the soil are easily procured.

Bad food, an insufficiently nourished body, worry and care, and much work consume the organism and bring an early old age; not only the external appearance of age, but also the organic changes of age.

An old organism is one that is declining and therefore more susceptible to disease. Every year of increase in age puts a man of ad-

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vanced years in another and higher "mortality class." It is, in a narrower sense, a chronic want of food which we have to combat.

Only a century ago, in European countries, the food of the lower classes of people was extremely miserable. Great numbers of poor people depended entirely on begging their food. We must not think ourselves the first to lay healing fingers on this sore. It will be interesting, perhaps, if I give an account in a few words of the beginnings of systematic improvement of the nutrition of the poor and of the masses.

The first man to whom we owe a thorough study of the nutrition of the lower classes was an American, Thompson, born near the city of Boston. Through various circumstances he entered the British service. He went to London, and from there to Munich, where he entered the Bavarian administrative service under the Elector Charles Theodor, attained a very high position and was elevated to the title of Count of Rumford. By this name he is well known in the history of physics. Much less known are his social and hygienic writings, though it is a great pleasure to read them. Rumford established in Munich the first organization for the improvement of popular nutrition. In our days there exist still popular Volks Küchenrecepten, the Rumfordsuppe, and the development of a kind of Volks Kuche, all attributable to Rumford's initiative.

Munich owes him by far the finest park, the "English Garden." There a monument to his memory bears the inscription:

Ihm
Der das schmälige öffentliche
Übel
Den Müssiggang und Bettel tilgte,
Der Armut "Hülf" Erwerb und Sitten,
Der vaterländschen Jugend
So manche Bildungsanstalt gab
Lustwandrer geh
Und sinne nach Ihm gleich zu sein
An Geist und Tat
Und uns
An Dank.

His life falls in the time when the real food values of the various foodstuffs were not yet known, but what he did for the improvement of the people's nutrition is to this day remarkable.

His first aim was to procure for the lower classes better opportunities to earn money. His second was to improve the technique of cooking, its cheapening, and the introduction of foreign foodstuffs before unknown in Bavaria, such as the American maize. He made use of barley and of the potato in forming cooking recipes, which furnished good and cheap food. He also turned against the excessive flesh diet of the English and recommended to the better classes

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the use of rye bread, macaroni, noodles, barley, and potatoes. More than a century has passed since then, and many improvements have taken place here and there, but in general public interest in this question has been roused only occasionally, to disappear again quickly.

Hygiene first developed in the direction of measures for the preservation of health, the sanitation of towns, and the prevention of infectious diseases.

In the field of the physiology of nutrition the laws of nutrition were gradually experimentally established by the Munich school. Then followed measures against the adulteration of foodstuffs; against alcoholism; for improved feeding in the army, in prisons, and hospitals; the establishment of people's kitchens and, since the nineties of the past century, a thorough study of the nutrition of the infant. Here and there thorough researches were made concerning the nutrition of certain professional classes, of farm workers, and of some groups of industrial workers.

In the course of time we have seen many social changes of significance with regard to popular nutrition. One of the most important factors which dominate the food question is the amount of mechanical work. It is clear that a blacksmith or a farmer in the field develops a far greater appetite than a clerk or a tailor; and the food requirements of the blacksmith will be quite different if he works 10 or 12 hours, or if, for want of full-time employment, he works only 4 or 5 hours a day.

With regard to the amount of work done opinions have enormously changed in the course of a century. Since the development of the industries by machinery the valuation of the human working power has changed. The bodily qualities of the worker have been forced by the employer more and more into the background of valuation. Industrial factory work requires strong men not so much as persons who can perform with skill the many small tasks which the machines have so far not been able to perform. Hence the tendency to employ children, half-grown persons, and women. With the extension of commerce the demand for office workers has increased, and in the administration of state affairs a whole army of officials is needed. The number of those who do little manual work increases. Factory laws have more and more tempered the severity and duration of work by shortening the working hours. Even in the country, in agriculture, machine work has substantially diminished the heavier kinds of work. This is, from a hygienic point of view, to be regretted, though this sounds rather paradoxical; for a certain amount of bodily labor is advantageous to the organism, as it strengthens the muscles, the respiration, the lungs, blood making and heart action. The harmfulness of some of these changed conditions has been recog-

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nized, and people try to balance the lack of paid muscle work by work for hygienic reasons, by play, and sport. Taken all in all, the food requirements of the civilized nations have decreased because muscular work has declined.

I am convinced that if we could determine the weight of whole nations we would find that this weight has decreased with the industrialization of labor, not because the race has changed in itself, but because the nutritive conditions have changed for a large number of people.

The question which interests us in this connection is not so much whether industrial workers possess a sufficient development for their work as whether their bodily condition is weaker than is consistent with the requirements of health. If we consider the population from the point of view of their work and their working capacity, we shall find that the country people represent the stronger and the city dwellers the weaker portion of the people.

Industrialization of the nations is accompanied by another phenomenon. In former times the cities were small, they were only inhabited by tradesmen, merchants, and State officials. The railroads have necessarily caused the erection of steam-power factories near the cities, and since then the growth of smaller and larger cities has steadily progressed.

In 1871, 64 per cent of the population of Germany still lived in the country; to-day scarcely one-half. In 1840, 91 per cent of the population of the United States lived in the country and 9 per cent in the cities; but at the present time more than one-fourth dwell in cities. In England scarcely one-fourth of the total population lives in rural communities. This distribution of the industrial workers is not without importance for the food question. It is just among them that conditions have at times been especially unfavorable. Only a small portion of industrial establishments are in rural districts, which offer for this class more favorable living conditions.

The people who do little muscular work live in cities. It is clear that in bodily development they can not be placed on a level in respect to food requirements with the people used to harder work. It is a great mistake that in many statistical works on nutrition the changed valuation of man as a power machine has not been considered. The modern industrialized population uses doubtless less food than a true working population of earlier times.

Life requires unquestionably a certain amount of energy in the food; without it our machine can not perform work, and, for certain trades and tasks, we are able to say how much food is necessary.

It is true a "luxus consumption" may occur; the most frequent deviation of this sort is seen in obesity, for the fat man is not only heavier, but he must eat more because he is heavier.

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If we examine the poor city population, overfed, fat people will rarely be found; lean persons are more frequent. If a certain degree of leanness is reached, we speak of undernutrition. Such an underfed individual often needs, with the same body length, 30 per cent less food than a normal person. But this condition is unhealthy, for such people lack often one-third and more of the normal cell content, the efficient substance; this results in harm, as I have already said. In an underfed person less food is required to satisfy the sensation of hunger. If one has passed a certain time with little food, he will get used to it. But, though he has no sensation of hunger, he may sometimes be sensible of his weakness, his reduced power to work, and the impoverished condition of his blood. The "managing expenses" of the underfed, if we may say so, are therefore less, and it is even possible that, in certain kinds of work, a man with such an impoverished body may be able to get along.

I do not want to go into details and explain here that we must, for hygienic reasons, combat such conditions of insufficient nutrition; I will rather mention the causes, which lead to such a condition. It is possible that it takes place when the total amount of the calories of the ingested food is too small. This is often seen in people of the better classes who have become poor, who carefully stick to their former way of living, but who, from want of means, have to reduce the quantities of food more and more, though a cheaper kind of food would preserve their weight. Much more frequently the cause of an impoverished condition is a lack of albumen. There are in the world many more albumen-poor than albumen-rich foodstuffs; the former are on an average more expensive.

Every race diet has developed on the basis of the products of the soil of the country. This was the invariable rule so long as means of transportation between different countries were primitive; but it is still a valid rule, as is notable in the case of those nations which long since ceased to produce enough food from their own soil. The habits of taste have lasted longer than the food supplied by their own soil, and their needs are satisfied by importation. Sometimes revolutions occur in the field of popular nutrition. Such a revolution was caused by the introduction of the potato in many extensive regions.

The principal parts of the food of a people are everywhere furnished by products of the soil. Wheat and rye, rice, maize, potatoes, and bananas are, according to the various countries, the essential parts of the nutrition of the people. The basic substance is therefore everywhere of vegetable origin. But none of these foods is used alone, on account of the necessity of change and the needs of the palate. The eaters of wheat and rye consume these foodstuffs mostly as bread, though they can be prepared in other ways. The potato

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can be prepared in a great many ways. Rice and maize are used chiefly for puddinglike dishes; the banana is eaten raw and cooked.

The additions to the chief food are almost always substances rich in proteid, mostly from the animal kingdom, meat or milk, or leguminous vegetables. Are such additions of a purely culinary nature, or are they of importance for the laws of nutrition? This question has only been answered by the researches of the last few years.

It can be demonstrated that, in the science of practical nutrition, we can not speak of a world menu as requiring a definite unit of proteid, for the various albuminous substances contained in the various foodstuffs have not the same value, as I was the first to show, and which the work of my laboratory has confirmed. A hundred grams of milk albumen, 100 grams of leguminous albumen, and 100 grams of maize albumen, are very different things.

For a normal man 25–30 grams of protein are, in favorable cases, sufficient, if it consists in milk albumen and in a certain amount of meat albumen, and if it is completely absorbed. This is an astonishingly small amount, and it is interesting to learn, that the infant, at the mother's breast, consumes a similar amount of proteid, if we make a comparative calculation.

But to apply this proportion to any kind of food as it occurs in practical life is not at once possible, because, as I have said, the different proteids have not the same value and because we have also to consider the differences of absorption, slight disturbances of digestion, and losses. A little more than the normal amount is to some extent a factor of safety to prevent the occasional losses of proteid. We can not go below the minimum figures, mentioned above for adults; in this lies their importance with respect to the considerations which follow.

I will now show in what relation the principal representative materials of popular foodstuffs stand to each other. I separate the food requirements, according to two large groups, persons with considerable muscular work and persons with light muscular work.

For a strong workman the following food materials are necessary to meet the caloric requirements: 3080 grams potatoes, with 83 grams proteid, equal to 65 grams meat or milk proteid; 800 grams rice, with 75 grams proteid, equal to 66 grams meat or milk proteid; 800 grams maize, with 78 grams proteid, equal to 22 grams meat or milk proteid; 1500 grams bread, with 98 grams proteid, equal to 38 grams meat or milk proteid; 3080 grams bananas, with 29 grams proteid, equal to 26 grams meat or milk proteid.

For a factory worker who does little muscular work we get the following figures: 2400 grams potatoes, with 65 grams proteid, equal to

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51 grams milk or meat proteid; 685 grams rice, with 58 grams proteid, equal to 51 grams milk or meat albumen; 620 grams maize, with 60 grams proteid, equal to 18 grams milk or meat albumen; 1031 grams bread, with 70 grams proteid, equal to 28 grams milk or meat proteid; 2400 grams bananas, with 22 grams proteid, equal to 16 grams milk or meat proteid.

If we consider the loss of albumen in the solid excretions we would approximately get: For potatoes, value of proteid, 44; for rice, value of proteid, 44; for maize, value of proteid, 9; for bread, value of proteid, 13; for bananas, value of proteid, 11.

If we now pass over some differences of absorption, it will at once be seen that, even with a large consumption, a strong workman can not possibly live on maize and bananas without the addition of nitrogenous food. What we hear about an exclusive banana diet in Africa is impossible. Still more unfavorable is the aspect of the popular food materials with regard to their albumin content for men who need less food because their work does not require great muscular exertion. Bread, maize, and bananas alone would be a starvation diet for them. Potatoes and rice will here just suffice, but certainly no more, when the body has been impoverished and has suffered a loss of weight and its total food requirements have been reduced. Without other nitrogen sources we could not, therefore, get along. The usual vegetables and fruits can not be considered, and the only nitrogen sources remaining are leguminous foods. But, as only six-tenths of their chemical contents of proteid can be considered for nutrition, it takes considerable quantity to obtain a sufficient amount of proteid. The soy bean occupies in this respect an especially favorable position, because it contains also a large amount of fat and is therefore much used in Japan as a popular food. Many valuable vegetable proteids can not be used by man as food, because his intestine can not dissolve the vegetable fiber. If we omit the Hindoos, an exclusive vegetable diet is of very great rarity. A preponderating vegetable diet is always accompanied by small amounts of animal foods, milk or milk products, fish, fowl, or the flesh of domestic animals.

Meat does not take a prominent place in the food of country people in the civilized countries of Europe, even in olden times, but milk and milk products are much used, which addition is very much to the purpose, as even moderate amounts of milk raise the proteid considerably. Such additions permit important variations of diet, increase the taste value, and lessen the volume of the daily food, as with the milk always a little fat can be used. Nobody can justly claim that such a meat-poor or meatless diet is good and sufficient. Workers migrating from the country to the cities, or

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industrial workers grown up in the city, become acquainted with other forms of nourishment which appear to them desirable as a sign of a higher social position.

A nutrition exclusively, or almost exclusively, based on cereals is, from a hygienic viewpoint, not at all perfect. Though in our days ergot poisoning does not occur and solanin poisoning by potatoes offers no general interest, yet in regions where maize is used as food in large quantities pellagra is to-day not a rare disease. Where rice is used exclusively, we find the beriberi disease. In the Japanese navy beriberi has been reduced in 14 years from 23.75 to 0.11 per cent by reducing the rice diet and introducing a mixed diet.

Nutrition in the cities has at all times a tendency toward refinement, but in former times, when the classes lived strictly separate, the food materials were also very different within the city walls. The food of the nobility was different from that of the middle class and the latter from that of the poor people. Among the materials successfully used in the culinary art a high place has always been held by the meat of mammals, fowls, and fishes. These meats were the chief part of the meal, other foods of vegetable origin, as salads and vegetables, sweets, and flour foods being added. Bread remained in the background. The traditions of this culinary art have remained the same down to our days. This diet of the upper classes is the only one which provides the pleasures of the table; it is rich in albumen and fat, it is not voluminous, does not overburden the stomach, tends less to obesity than any other diet, it keeps the body even of a lazy man in good condition, and does not overwork the digestive functions. The less well-to-do reduce, of course, the amount of meat, but they use in its place bread and potatoes. This is called a mixed diet. When the barriers between the classes fell, the middle classes gradually rose to the more luxurious eating of the formerly privileged classes.

It is a fact that the diet of the well-to-do is not in itself physiologically justified; it is not even healthy, for, on account of false notions of the strengthening effect of meat, too much meat is used by young and old, and by children, and this is harmful. But this meat diet is publicly sanctioned; it is found in all hotels; it has become international and has supplanted, almost everywhere, the characteristic local culinary art. It has also been adopted in countries where European culinary art was unknown. Long ago the medical profession started an opposition to the exaggerated meat diet, long before the vegetarian propaganda was started. It was maintained that flour foods, vegetables, and fruit should be eaten in place of the overlarge quantities of meat.

The descendants of those well-nourished classes are, on account of many influences, especially the school and the indoor life, not always

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the strongest part of the nation, but, since in recent times bodily exercises have become general, they are again decidedly in the ascendency.

The sanitary conditions of the great mass of industrial workers and their children, and of people of very small earnings, are different. Here we find a decided deterioration of the body, as is amply shown by the recruiting services. In spite of continuous migration from the country to the cities conditions are little changed. The social surroundings of a great city are decidedly unfavorable to the maintenance of a strong race. Among the many factors which cause this decrease of bodily efficiency, nutrition is not the least.

The industrial workers coming from the country to the city can not well get along with their former simple diet, because the cheap food materials which are easily obtained, as bread and potatoes, contain too little proteid. They undoubtedly need an increase of albuminous material. Neither can they find in the city the food conditions to which they had formerly been used; but they accommodate themselves rapidly to new conditions, coming into the new surroundings, as they usually do, without a family. Just as under the doctrine of political equality the lower classes try to achieve the table luxuries of the well-to-do, so it is not surprising that industrial workers, coming from the country to the cities, accommodate themselves to the new dietary forms.

The workingman does not want proteid, leguminous food, milk, etc., to improve his vegetable diet; he wants simply meat, not because he needs it but because it is for him a matter of pride to follow as best he can the other classes in his diet. The difficulty is that the cost of meat is considerably higher than in the country, where food can usually be obtained without the aid of dealers and where many foodstuffs are raised on one's own soil.

By far the cheapest articles, according to the present prices, are potatoes, peas, and rye bread; the cheapest vegetable is green cabbage; the cheapest animal food, milk and cheese; the cheapest meat, the herring; the cheapest fruit, dried apples. Sugar is in price about equal to wheat bread, but beef is always expensive. Instead of butter the poorer people use beef suet, or other animal fat, and vegetable fat. As the prices of meat are high, beef must be replaced by the cheaper fish meat; wheat and rye bread are replaced by potatoes, coffee by substitutes. The meat of sausages is frequently of an inferior grade, which undisguised could not be sold as meat.

Every increase in prices alarms the workingman, lest he may have to get along without this or that article which he likes, and he is the last man to ask himself whether such self-denial will be harmful to him or not. If a man of the better classes is advised by his physician to reduce his allowance of meat and to deny himself here

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and there, he usually follows the advice, and to-day there are many people who have learned the wisdom of self-denial.

Though the tendency to imitate the diet of the better classes is certainly an important factor in the nutrition of the great masses, it is not the only cause of the constant increase of meat consumption in the cities, as observed in the last few decennia. In this connection a very remarkable fact must be mentioned which has been overlooked heretofore.

Forty years ago it might be said that the diet was by far too deficient in fat; to-day it is astonishing what a rôle fats play in many parts of Germany, and also in other countries. Bread, which was formerly eaten alone (in south Germany, Austria, France, and Italy it is still done), is now only eaten with butter or some other fat. The consumption of fat has increased so much that in many parts of northern Germany twice as much fat is consumed as compared with southern Germany. The result is that, with the high energy value of fat, the large quantities of vegetables formerly used are not now needed, while a corresponding amount of vegetable proteid, now omitted, must be replaced in some other way. One hundred grams of fat correspond in combustion value to 260 grams of flour, with 26.5 grams of proteid; 100 grams of fat corresponds in combustion value to 950 grams of potatoes, with 20 grams of proteid; 100 grams of fat correspond in combustion value to 278 grams of rice, with 19.2 grams of proteid.

The man with a small income uses 6 to 7 per cent of it to buy fat, partly butter, partly oleomargarine. The large consumption of fat is frequently connected with a rapid increase of the consumption of coffee. The consumption of real coffee is by no means a measure of the use of this beverage, because immense quantities of substitutes are consumed. The consumption of milk is also rising in the cities, but the classes that drink much coffee do not form the larger portion of the consumers of milk. In Germany, as in England, the coffee and tea drinkers eat much buttered bread at all times of the day.

Where sugar is cheap its consumption has also considerably increased. Sugar, too, displaces a portion of the nitrogenous vegetables in the dietary. In many groups of the population, especially in the lower classes, the consumption of alcoholic beverages has not been reduced in the same degree as among the educated classes. It is not rare that 10 to 11 per cent of the income is spent in this way among the poorer classes. I have already said that the consumption of alcohol is, according to the science of nutrition, equal to a deterioration of diet, because it causes, in proportion to its energy value, a reduction of the other food materials, especially of bread, potatoes, etc., so that here also a lower proteid level results.

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The loss of proteid from the dietary attributable to the use of fats, sugar, and alcohol is, of course, significant. The consumption of 100 grams of fat, 50 grams of sugar, and 50 grams of alcohol is not at all rare among the modern additions to the vegetable diet of our times. With such a diet it is not at all possible to carry nutrition on with cereals and potatoes without the addition of a proteid food, for the proteid content is enormously reduced, and the proteid thus displaced can not be restored from a vegetable source.

Let us assume a man to be carrying on his nutrition with pea meal; then he needs for 2,400 kilogram calories per day 690 grams. If he consumes with this 100 grams fat=930 kilogram calories, 50 grams alcohol=355 kilogram calories, and 50 grams cane sugar=188 kilogram calories, these nitrogenous free substances amount to 1,473 kilogram calories, and the man needs therefore 407 grams less of peas than before, therefore only 690—407=283 grams of peas. The latter contain 73 grams albumen, 5 grams fat, and 162 grams carbohydrates. The nutritive value of the pea albumin is only six-tenths of that of the milk and meat albumin. Therefore only 44 grams of proteid can actually be utilized.[1]

We learn from this vegetable food, which is extremely rich in proteid, that this whole development of the nutrition of the poorer classes must, from its irrational composition, lead to a great lack of proteid, as well as to the necessity to consume animal food. But among the city populations it is not milk and not cheese, but meat, which forms the source of animal food.

Sandwiches play in our time a great rôle in nutrition, not only among the poorer classes but also among the well-to-do. This is to a great extent due to the labor conditions in the great cities. With the English working hours, sandwiches are very convenient. The workingman, who works frequently very far from his home, takes sandwiches with him; they are compact, can be eaten quickly, anywhere, in a few minutes, and they are nourishing. Any "automat" furnishes this modern meal. Rolls are also most convenient for thousands of people who, for some reason, can not take a regular dinner or supper.

As necessary as fat is for a strong workingman with a large consumption of food, because we can only by its addition prevent too great an increase of the food volume, it is now extensively consumed by people who take daily 2,400 to 2,600 kilogram calories. If a family spend as much money for potatoes, flour, rice, leguminous food, and vegetables, it is not a physiological necessity, but an unhygienic habit, which can be dispensed with.

In the unfavorable food conditions just mentioned lies the chief reason of the increasing demand for meat and of the increasing food prices, though the food does not increase in nutritive value. There-

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fore the quantity of food is frequently reduced, or the necessary amount of proteid can not always be made up by the expensive animal foods. The demands on the cooking art and for warm food are more and more reduced.

We thus see how, for city dwellers, the food changes for various reasons, and the prices of meat become for a large portion of the poor population very important. With the great expense in money for this kind of food, there remains scarcely anything else but potatoes to satisfy the dietary needs of a chief meal.

Most conservative as to the food question is the farmer, though in the country, too, many changes are taking place. He has frequent contact with the city, but he has still plenty of food material, though not always quite suitable to the purpose. I have noticed a very unfavorable influence of urban food requirements on the milk-producing districts of some regions of Switzerland and Germany, which is so characteristic that it deserves consideration. The milk-producing regions of the Bavarian highlands and of Switzerland had formerly an extremely healthy, strong, and temperate population. Milk was largely used as food, and the excess of production was placed on the market. In the course of years the communities gradually established central dairies, in which the fat is withdrawn from the milk by means of centrifuge machines to produce cream and butter. The impoverished milk is partly returned to the farmers. The milk producers are paid in cash for their product, but a poor and insufficient food takes now the place of a former healthy one. The money goes to the saloons. The potato conquers a new territory. Instead of the butter which was formerly used, cheap fats are now bought; in short, the change of diet is exactly such as we find with the poorer working population in the cities. The effects are exactly the same. The bodily qualities in such districts deteriorate more and more, sinking to a low level. This is a very serious condition, which attracts attention and which must be combated by all possible means.

The population, especially of the large cities, suffers in many ways from abnormal nutrition, which manifests itself in a reduction of the size of the body, and of the bodily development, with all its unfavorable consequences. In all civilized countries the country population represents still the healthiest types of man, whose conservation is absolutely necessary. I have already shown that this source is shrinking more and more on account of the migration of the population to the cities. So much the more must we consider the protection of rural population against the loss of its food supply.

For the various reasons mentioned the city population lays the chief weight on a meat diet, and the poorer classes see, in every increase of the price of meat, a great calamity. There are, of course,

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thousands, who have to stick, willing or unwilling, to a preponderating vegetable diet, and they see poverty in such a diet; though, in other parts of the country, we find people contented with the same diet and the same food materials. The valuation of the diet by the layman stands always in relation to the money his fellow man spends for food. There are doubtless also families very well satisfied with the humblest kind of food.

In considering the underlying causes of insufficient nutrition of the people, we do not reach the idea, that hunger is always knocking at the workingman's door. We see evil social conditions which lead to insufficient food conditions, rather than an utter inability to procure sufficient food; and often the cause does not belong to food physiology. An increased income may lead to improvement of nutrition, but the considerations which arise here, do not belong to hygiene. I simply mention the cheapening of foodstuffs by tariff reduction, the elimination of the middleman, the workings of trusts, and importations by consumers' associations.

Of great value would be the establishment of cheap restaurants, which would furnish the workingman really nutritious food for the noonday lunch which he must eat away from home.

It would be a great improvement if the factories were not built in or near cities, but in the country; for, not to mention the housing conditions, it is there much easier to obtain cheap and healthful food, and the workmen could even raise some of their own food supplies. In the cities small expenses for luxury and pleasure grow very fast, while in the country there is usually no chance at all to spend income foolishly.

The agricultural worker in the service of the great landowners is not so favorably situated as the independent farmer, but he is better off than the workingmen of his class in the cities.

The struggle against alcoholism is also a factor of immense importance. Millions of people could be well nourished if they would cease spending enormous sums for alcohol, for the expenditure of 10 to 20 per cent of the income for alcohol is, unhappily, not rare.

In the cities the food question is also complicated with the housing question, especially rents, for dwelling and food are the most important items in domestic economy. In many cities of Europe the advantage taken of the financially weaker middle classes, and of working people, by real estate speculators and building and loan associations, by high rents, and by hindrance of city development, has reached the status of public calamity. The means of procuring nourishment are thus greatly limited. It makes an enormous difference whether people have to spend one-tenth or one-fourth of their income for rent.

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In the countries and in cities where rents are very high the workingman must live in quarters so narrow and crowded that he can not speak of a home or of family life, and in consequence the workingman pays long and frequent visits to the saloon, merely to escape his own narrow dwelling. Frequently this home is not occupied by him alone, part of the space being rented to strangers. These ruthless speculators who transform dwelling houses gradually into one-room dwellings are commonly called "Wohnungszertrümmerer" (house-wreckers), but it would be truer to call them "Familienzertrümmerer" (family-wreckers). They are responsible for a great deal of hygienic misery in great cities, though no attempt is made to stop their piratical business. Thousands of families are not able to procure dwelling space with a kitchen and must eat somewhere else, thus incurring greater expenses. For hundreds of thousands of families, therefore, domestic hygiene requires a solution of the food problem.

Often it happens that the parents, husband and wife, both work in the factory, and thus only supper can be taken at home. In many cases want of knowledge on the part of the wife is the cause of poor nutrition. This is true not only of the poorer classes, but generally. Instruction in domestic management must inevitably become a required study for young girls. The wife must know how to manage the income. She must know the food materials and their nutritive value and how to produce good and nourishing food. For this the basis must be laid in school. Nobody needs such instruction more than the wife of the workingman, especially those girls who, early in life, undertake factory work and early become wives and mothers, without the least knowledge or experience in domestic management or in the care of children. It is unbelievable how foolishly small means are often spent. In thousands of families there would be adequate nutrition if the wife knew how to manage things. Housekeeping schools must be the means of solving problems of nutrition.

The husband, too, should have a knowledge of diet, that he may hold the proper views on the question. Such an education, it must again and again be said, is only possible when the elementary school becomes a vehicle of hygienic knowledge. Only a few civilized countries have so far introduced hygienic instruction into popular education. In most cases hygienic teaching is furnished only in portions of textbooks on other subjects. The age of school attendance is the proper time to establish sound hygienic views. When once imbued with false opinions it is immensely difficult to free the minds of children from wrong views, and on this account it is most important to begin with this instruction in the elementary schools.

The food question must also be considered with regard to the coming generation and to the growth of the nation, as well as with regard to the well-being of the children. Complaints are frequently

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heard of late years about the increasing sterility of women. Doubtless the reasons for this are very different among the different nations, and it would be an idle task to search for the causes of decrease of births. I will only mention what may be said with regard to nutrition. It is certain that the fertility of women is greater in the country and that it is especially the great cities which show a decrease of births. Experience shows that fertility decreases as the social standing becomes higher. Wherever the lower classes gradually rise into higher social levels the number of children decreases, because wealth and culture lead gradually to a protection of woman against too many births, and because a good education of the children does not admit of a large number, and because the age at which the husband marries is in itself a restraining factor.

In the country children are helpers at work, and a wife who bears few children is not desirable. The cost of supporting them is of little importance considering the simplicity of life in the country. In the lower classes of the population of the great cities we find the greatest poverty usually among the families with many children. The difficulty begins with renting a dwelling. Many house owners refuse to take families with many children just as they do not allow the keeping of cats and dogs. The care of children requires the undivided attention of the mother. The children themselves grow up among unfavorable conditions. Large buildings, in themselves insanitary, compel families with many children to live in one or two rooms. It is impossible for each member of the family to have his own bed or sometimes even a proper sleeping place.

In summer the only resort is a courtyard, with little light and air, or the street, made dangerous by passing vehicles. In the city children are unproductive, for they can not work, as is possible in the country.

The chance to work is denied to city children. The conditions of life for children have not at all improved in recent years in our great cities. The difficulty of providing them with food increases more and more; and yet there are people who are astonished that under such conditions the number of children decreases. Is it not most remarkable that, under present conditions, so many children are born and raised in the great cities?

Leaving the discouraging questions of housing and food, and of the dissolution of family life, our attention is at once attracted to the care and nutrition of infants. In recent years the nutrition of infancy has been a subject of deep concern both to physicians and laymen, from the merely quantitative viewpoint of saving the generations, especially in those countries where increase of population is slight and the mortality of the children inflicts serious loss in the

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numerical strength of the nation. Although great progress had been made in the prevention of adult mortality, the mortality of the children seemed to continue almost unabated. Without scientific study of this question a solution was impossible. Not until we began to search for the causes did we reach solid ground.

In the field of infantile nutrition the fault lies with mothers who are ignorant concerning the care of children, and, in the second place, in poverty; but the former cause is the more important.

A great movement is now on foot among poor and rich to spread a knowledge of child nurture, and we may expect its ultimate success. Many questions are to be solved; the promotion of breast feeding; the search for a substitute for milk where breast feeding is impossible; improvement of cow's milk for children; the cheapening and even free dispensing of milk for children's use. The care of children has of late years attracted great attention in Germany and other countries. But until housing conditions in the great cities are greatly improved our efforts will be rewarded by only very partial success.

Another great and new field of the food question awaits our attention—the question of removing the bad effects of insufficient nutrition of school children by free feeding at the schools. It is not in itself a new field, for as long as insufficient nutrition is found among the people the children are also affected by it. Insufficient nutrition of school children is only one symptom of the general condition of the people, a symptom which facilitates the diagnosis of bad general conditions, revealing them very clearly since compulsory education has brought all the children under general supervision. Whoever does not believe in the defects and shortcomings of our food conditions, whoever considers them exaggerated, may find in the conditions of the nutrition of the school children evidences of the actual state of affairs in the population at large.

The question of furnishing free meals to school children has been a subject of much study. Complaints about insufficient nutrition long ago attracted the interest of charitable people, and they furnished relief to the best of their ability. But the conditions became very much worse with lapse of time, and the consequences more marked. Here, too, we find the same end—causes whose evil influence is manifest on the nutrition of the masses. The problem has become chronic and concerns the state in its most vital interests, in the strength and vitality of the coming generation. It has been found that, summer and winter, a small proportion (0.6 to 1 per cent) of children go to school without breakfast; many more children (3 to 5 per cent), summer and winter, in spite of charitable assistance, receive only a small cold lunch instead of a warm meal at noon. Some of these children receive, at least in the evening, a warm meal, but there are tens of thousands of children who have a

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warm meal neither at noon nor in the evening. Thousands go to bed without any supper. In the life of the school children the want of food plays therefore an important rôle.

Bad nourishment leaves its mark on the body of the child, though childhood has its own resistance against harmful influences, in so far at least as grief and care can not make such deep impressions as in later years, and childish vitality, with its carefree mind, easily survives its troubles. After bodily injuries of short duration, youth has the faculty to recuperate when times of better nutrition return. How convalescent children thrive in a few weeks when they are properly taken care of! But all these advantages of the young body have their limits, and notwithstanding these advantages we can not be deceived as to permanent injuries from insufficient nutrition such as are observed in children of school age.

Pale faces, anemic skin, stunted growth, the impoverished body, show us what serious injuries are inflicted upon the young organism, how an unkind fate threatens to kill the strength of youth in its bud.

Since school physicians, of late years, have been examining children more closely with regard to the condition of their health, there is no end of complaint. Especially in the public schools the percentage of children with poor constitutions is very large, five and even ten times greater than in the schools which are mostly frequented by children of the more comfortable classes. This is an enormous difference, especially when we consider that in the better schools, too, many well-founded complaints are heard about poor health of the students caused by overwork.

It is then a fact that many children are insufficiently nourished. How can the pleasure of study be experienced by underfed children? How can hungry children be able, though ever so willing, to follow the instruction? The brain, like any other organ, refuses to work when food is withheld. Memory and thought are dulled, fatigue increases. How can a poorly nourished child accomplish a task intended for a normal child? How easily the teacher misjudges inertia of the brain caused by a bodily condition, though the child does perhaps as much as he can.

The impoverished, anemic child suffers much more from the changes of the weather than a healthy child. He finds no pleasure in play or gymnastics; his muscles are too weak; bodily exercises are for him not a means to develop and strengthen the body; they merely consume the scanty nutrient material of his blood. And so, the impoverished child, having a hard struggle for existence before him, with an inferior preparation as compared with other children, leaves the school. He brings less knowledge with him into life, is mentally weaker, he feels his unfavorable social position, and carries the seed of discontent and bitterness in him. No loving tie at-

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taches him to the family, no pleasant thought lives in his memory. Morbidity and mortality are doubtless much larger among these children, and every wasting disease more dangerous to them. Many chronic diseases are acquired in this period of life.

From this source of an unhygienic youth, a great army of weaklings is thrown upon the state, who as workers do not count and who have to be discarded at the recruiting office. It is of vital interest to the state, therefore, to prevent these forms of degeneration, the lowering of physical qualities which are especially observed among the young people in great cities and in industrial districts. It is no more than self-preservation for the state to lend its aid in combating these conditions.

It is not always insufficient nutrition alone which leads to poor bodily development among school children. In many cases it is an irrational way of feeding the children. Instead of being fed with a good, cheap breakfast, they are given useless beverages, like coffee and its substitutes. Frequently the needs of the body of the child are not considered; milk as a food is early abandoned, and the child is put on a diet suitable for adults. Many children who have weak stomachs do not thrive on cold food, do not eat enough, and so lose strength. For many of the conditions mentioned poverty can not be held responsible; they are chargeable to carelessness and ignorance on the part of the mother and of the family.

In other cases social factors play a chief rôle; the difficulties are not directly due to insufficient nutrition. The effects of poor nutrition are rendered more severe because the food requirements are unnecessarily increased. Thus the housing question, for instance, has also its importance in this connection. Very often poorer families have to get along with unheated rooms. Continued cold increases the food requirements of the children. The same may be said with regard to insufficient clothing. In many cases boys and girls have to do hard work at home and do not get a corresponding increase of food. It has also been observed that children who spend many hours on the street suffer a loss of bodily strength from a want of proper care. From what has been said it is clear that not all forms of deterioration of the bodily constitution are due to insufficient nutrition in the narrow sense.

As a practical means to prevent the evil effects of poor nutrition we began years ago to feed the children at school. This was done in various ways in different parts of Germany and in other countries. In some places a breakfast is furnished; in others a second breakfast. In other cases there is a demand for a warm meal at noon, and sometimes also for a lunch in the middle of the afternoon. There is no doubt that the desired purpose, the improvement of

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nutrition, is accomplished by these means, that thousands of children are thus saved from a joyless youth and grow up healthy members of society.

By feeding the children at school, however, our task is not completed. Besides feeding children in the schools, it is absolutely necessary to supervise and care for the children in so-called day nurseries (Kinderorte). These institutions are a great blessing. Here much can be done for the hygienic and ethical good of children who do not see their parents until late in the evening. In these Kinderorte the children prepare their lessons, they learn various forms of handwork, and they receive bodily and mental care.

A great disadvantage of feeding the children at public expense is the abuse of such a benefit where the system is handled in a lavish way. We know from experience that poverty is frequently not the reason why the children are sent to school without breakfasts. Carelessness of the parents, a disorderly household, and late rising are often to blame for these conditions. The want of a meal at noon is frequently caused by the occupation of the mother, or of both parents, away from home. When husband and wife go to their factory work in the morning, the children can not have a warm meal at noon, though, under favorable circumstances, they are given a couple of sandwiches. In such cases, too, it is not always poverty which causes poor nutrition of the children. From all these cases we must, of course, set apart those in which we find real indigence, and poverty which is not the fault of the parents. It is very difficult to decide in some cases whether the parents are at fault or not.

Quite correct is the idea expressed in the State regulations of England and Wales concerning the feeding of school children, namely, that the children are to be fed where the necessity is apparent, but the expenses are placed on the parents if it is found that they are able to bear them. This reform is desirable from the standpoint of both hygiene and physiology. We must have a healthy race, and we must apply remedies wherever evil conditions are found, no matter how such conditions may have arisen. The ways and means of feeding children at school are after all subordinate to the actual need of food.

How should we feed the children? If it has been found that a child is insufficiently nourished, it is the task of the authorities to furnish the food which is wanting. Sometimes the first and second breakfast must be furnished, sometimes dinner or supper. But we must always remember, especially where the noon meal is wanting, that two tasks are to be accomplished:

1. The impoverished child must be raised to the normal weight which corresponds to its size; i. e., the body must be put in a healthy condition.

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2. Sufficient food must be furnished to keep the child at his normal weight.

From what has been said it is clear that the food must be plentiful and must not be measured by the weight of an impoverished child, for it must improve this weight.

The food requirements at the school age have been sufficiently well established. We may assume 24 kilograms as the average weight of boys and girls between 6 and 11 years. For children of this size 1,482 (in round numbers, 1,500) calories are generally sufficient. Impoverished children who weigh less may be able to reach the normal weight if they receive the nourishment mentioned above, but no harm is done if we furnish them a little more food, enabling them to reach the normal weight more quickly.

Of importance is also the combination of food materials. For the age mentioned above I consider the following amounts sufficient, assuming that a large part of the albumin is of animal origin and that milk forms a part of the diet: Proteid, 64; fat, 50; carbohydrates, 187.

On this basis we can supply a breakfast or a noon meal, while the supper is left to the family. From some practical cases I estimate the supper of a poorly nourished child, in round numbers, at 358 calories, with 15 grams of albumin, 12 grams of fat, and 45 grams of carbohydrates. The portion which remains after deducting this supper, and which must eventually be covered by the feeding school, I divide in the following manner:

A. For the first and second breakfast together, 13 grams of albumin, 12 grams of fat, and 37 grams of carbohydrates equal 317 calories.

B. For the noon and evening meal together, 36 grams of albumin, 26 grams of fat, and 104 grams of carbohydrates equal 816 calories. The marked accentuation of the noon meal serves as a safety factor with regard to the evening meal, which will often be very scanty. If we consider what sums are spent for other hygienic purposes—water supply, sewerage, etc.—the sums spent for feeding school children are exceedingly small.

It would doubtless be desirable to study the food conditions in the various countries of young people who have left school, for it is certain that we could find many deficiencies at this period of life, which are the more important, as the time of puberty and the years immediately following are of vital significance in the development of a healthy body.

The nutrition of the great mass of the people is a question of the highest importance, deserving far more attention than it has hitherto received. All the great countries ought to have a central authority, a food commission, which should concern itself exclusively with the

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far-reaching questions of the well-being of the people. The material as it lies before us to-day is very incomplete, but suffices to indicate the main lines of useful work. The nutrition of the masses has so far been mostly studied with regard to political economy and according to methods and viewpoints which do not always withstand the tests of the physiology of nutrition. Only by means of the physiology of nutrition is it possible to carry on exact research.

The nutrition of the masses is to us a problem which may be approached and improved from many different sides. It is necessary that not only the hygienists, in the narrower sense, take up the struggle for betterment, but that also the great army of men who are truly humanic in their hearts shall take their places beside us. The battle which we have to carry on is not only against unavoidable and natural difficulties; we must not forget that human society includes many elements unwilling to make the least concession to a humanitarian movement, persons whose prosperity is selfishly held superior to the welfare of their neighbors, and who will oppose such a movement with all the means at their command. Let us hope that our opponents will, at the last, rejoice with us in the triumph of the humane idea.

[1] Sixteen grams are lost daily in the solid excretions.

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JOINT SESSION OF SECTIONS VI AND VII. MONDAY AFTERNOON, SEPTEMBER 23, 1912.

CENTRAL SANITARY ADMINISTRATION IN THE UNITED KINGDOM.

THEODORE THOMSON, C. M. G., M. D.

I have been asked to present to you an outline of the principal features of the public health administration which is undertaken by the central departments of the State in the United Kingdom, in complement to contributions which are being submitted by Dr. E. W. Hope, medical officer of health for the city of Liverpool, who deals with methods of sanitary administration in a large English city, and Dr. George Reid, medical officer of health for the county of Stafford, who deals with these methods in an important English county.

With us, central public health administration is undertaken by different Government departments according to the matter in hand, and thus comes under the direction of the several ministers who are responsible to Parliament for the conduct of these departments.

To apprehend correctly the place which administration, in connection with public health, has come to occupy in the work of the State, and the varying extent to which it has, in the past, been undertaken by the several central departments, would require an excursion into the history of social and political changes in the United Kingdom which is beyond the scope of this paper. Such a history, in respect of the development of public health organization in England during the Victorian era, has been given by Sir John Simon, the first medical officer appointed in the central sanitary service of the country, in his book on English Sanitary Institutions (Cassell & Co., London, 1890). It may be hoped that the subsequent period will ere long find as competent and distinguished a historian.

In enumerating the Government departments concerned the Local Government Board requires first mention. The Local Government Board was established in 1871 as the central department, which, inter alia, was to direct the work of the "boards of guardians" which administer the English poor laws and to control and guide the administration of the local authorities at that time principally concerned with sanitary matters and prevention of disease. The central medical department of the State, previously in the department of the Privy Council, was then transferred to the Local Government Board, by which the work of the Privy Council in relation with epidemiology, administration in relation with imported exotic diseases of an infec-

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tious character public vaccination, and certain other matters relating to health, was continued and has since been developed.

At the present time the Local Government Board, apart from its poor-law functions, which need not here be further referred to, is in a controlling or advisory relation with the elective governing bodies or councils of each of the 1,822 sanitary districts into which England and Wales is divided (county, metropolitan and other boroughs, urban and rural districts), and also with the 62 administrative counties in which all these sanitary districts, except the county boroughs, are included. The head of this department is a cabinet minister whose office ranks with that of a Secretary of State, and which has a large secretarial staff and numerous technical officers and expert departments, which include a medical department. The board's medical officer is at the head of a staff which comprises 3 assistant medical officers and 15 medical inspectors, either selected from the local public-health service or chosen for some specialized experience in particular directions. There is also a subdivision of the medical department which deals with matters relating to the purity of food and the prevention of adulteration, and another subdivision which is entrusted with the preparation and distribution of vaccine lymph. Laboratory research required by the department is carried out principally by arrangement with investigators who are not themselves officers of the board; recently, however, the board has established a pathological laboratory of its own. The series of annual reports of the medical officers of the Local Government Board and the published reports of the inspectors in the medical department furnish the best evidence of the general nature of the work there carried out and now in progress. I would take this opportunity to convey the regret of the medical officer, Dr. A. Newsholme, that he has unavoidably been prevented from attending this Congress.

For Scotland and Ireland separate Local Government Boards exist, working on lines in the main parallel to those of the Local Government Board, but modified as a result of the different character of the areas of local government and the special laws in those countries. Each of these two boards has a medical member and staff of medical inspectors.

The Home Office, under the Secretary of State for home affairs, undertakes the central administration of the law relating to factories and workshops, which was amended and consolidated in 1901, and in so doing deals with many matters closely affecting the health of the industrial population of the country. The organization of central inspection of factories in the United Kingdom (some 100,000 in number) and other work of the factory department is directed by the chief inspector of factories, Sir Arthur Whitelegge, who before his appointment to this post was medical officer of health to one of the principal English counties. Two medical inspectors of factories are included

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in his staff. Reports giving full accounts of the activities of this department are published annually and presented to Parliament. The Home Office is also concerned with duties of supervision in connection with establishments for inebriates and the medical inspection of prisons. Institutions for the reception of lunatics are controlled by a separate body, the Lunacy Commission, which is attached to the high courts of justice.

The Board of Education, which came into existence as a separate ministry in 1899, has exercised important public health functions since 1907, when Parliament instituted a national school medical service. This involved the creation of a medical department for the board whose work, with the work of the local school medical service, is reviewed in the annual reports made to the Board of Education by their principal medical officer, Sir George Newman. The staff of the medical department of this office includes three medical officers. Scotland and Ireland have separate education departments.

The General Register Office, which is under the direction of the registrar general, and has the president of the Local Government Board as its parliamentary head, dates back to 1834. It undertakes the collection and analysis of national statistics of England and Wales in respect of births, marriages, and deaths. These appear in weekly, quarterly, and annual reports of the registrar general, and in special decennial supplements. It is customary for the post of superintendent of statistics in this office to be filled by a medical officer who not only is an expert statistician, but also has had experience of public health administration. Separate register offices, working on similar lines, deal with the statistics of Scotland and Ireland, respectively.

In relation with other central departments concerned with public health administration, reference may here be made to the work of the Army Medical Department on the hygiene of the military population (examples of which will be found in the annual reports of the director of the army medical service and in the journal of the Royal Army Medical Corps) and to the last created central department, the National Health Insurance Commission. This commission will shortly exercise control over the system of medical treatment which is to be provided, under the new National Insurance Act, for the great bulk of the working-class population, and its work may be expected to have far-reaching influence on public health in the country. The English commission includes a medical member, and has a medical officer on its staff. Separate commissions, each with a medical member, have been appointed for Scotland, Ireland, and Wales.

A list of the acts of Parliament administered directly or indirectly by the departments I have mentioned would be of little value to those unacquainted with acts; while it is impossible to catalogue within a small space the numerous subjects of public health adminis-

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tration for which the president of the Local Government Board or other ministers concerned are held answerable to Parliament. I shall, therefore, refer to only a few subjects of particular interest in relation with public health administration by our central departments.

GENERAL SANITARY CONDITION OF LOCAL AREAS.

For general measures intended to secure healthy environment, such as water supplies, sewerage, sewage disposal, public scavenging, and the like, responsibility rests primarily with the local authorities. Information, however, as to the character of such provision made by these authorities is obtained by the Local Government Board, and action is taken by the board on sufficient evidence of local neglect or deficiency. It is the duty of the medical officer of health of each locality to prepare and submit to his council an annual report describing the sanitary circumstances of the district and directing attention to conditions unfavorable to the health of its inhabitants; and he is required to transmit copies of these reports to the Local Government Board. Where it is deemed desirable, particular areas are inspected and reported on in detail by the board's medical inspectors.

In pressing local authorities to effect improvements in the sanitary conditions of their districts, the Local Government Board may, in certain instances, exercise powers of supersession of an authority which has failed to carry out its statutory duties; or the board may take proceedings with a view to obtaining an order in the high courts requiring the authority to take such action as may be necessary: in practice these powers are seldom exercised. Where a local authority desires to raise a loan for the provision of public works, the law in most cases requires that it shall obtain the board's sanction to the loan. In such cases the plans and estimates of the works proposed receive expert examination and constructive criticism, and usually a public local inquiry is held before borrowing powers are conferred on the local authority. The board also frequently issue administrative orders empowering local authorities to act together for special sanitary purposes, such as the joint provision of water supply, sewerage, or hospitals.

ADMINISTRATION IN REGARD TO HOUSING.

Under certain conditions local authorities have powers and duties to cause houses unfit for human habitation to be repaired or demolished; to deal with unhealthy areas by improvement schemes; to purchase land and erect buildings for working class dwellings; and to regulate town. planning. Since the Housing and Town Planning Act, 1909, came into operation, the Local Government Board have had increased authority in the supervision and stimulation of this local

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work. The board require special information to be furnished by local authorities on housing matters, or obtain it by means of local inspection. Proposals of local authorities for the provision of working class dwellings receive detailed consideration by the board's officers, in their financial and technical aspects, before the necessary authority is given by the board. In some instances, as for example, where an owner of condemned property is aggrieved by the action of the local authority, an appeal lies to the board, and the matter is usually dealt with at a public local inquiry held by one of the board's officers.

ADOPTIVE ACTS AND BY-LAWS.

Many powers required by the local authorities are obtained by the adoption of acts of Parliament or of by-laws, with the sanction of the Local Government Board. In these cases the board are concerned not only with the suitability of the proposed by-laws or acts for local needs, but also with the question whether the by-laws which they are asked to allow are not in excess of the powers conferred by the statutes under which they are made. Model by-laws for the regulation of new streets and buildings, houses let in lodgings, removal of refuse, keeping of slaughterhouses, and many other subjects are issued by the board for the guidance of local authorities.

APPOINTMENT OF LOCAL SANITARY OFFICERS.

The appointment of local sanitary officers rests with the local authority concerned, but, in almost all instances, these appointments are subject to the sanction of the Local Government Board and, in the case of many medical officers of health, the board's assent is necessary before the officer can be dismissed by the local authorities. At present nearly all municipal and county medical officers of health give their whole time to public health work. In the urban and rural districts the medical officers of health who give their whole time to public health work are in the minority; but their number is increasing. With encouragement from the central departments concerned, it is becoming frequent for appointments such as school medical officer, and medical officer to infectious diseases hospitals, to be held by the medical officer of health. The general duties of medical officers of health of all the local authorities are prescribed by orders of the Local Government Board.

DISEASE PREVENTION.

The Local Government Board issue weekly a statement of the number of cases of "notifiable" infectious disease reported to them by medical officers of health in each district in the country. The board may authorize the inclusion of additional diseases in the list of diseases

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ordinarily "notifiable." The board obtain reports of outbreaks of infectious disease and, where necessary, cause investigation to be made by their medical inspectors, both as to the causation of the disease and as to the steps necessary to prevent its spread. Some of the principal facts of epidemiology have been obtained in the course of official inquiries of this sort.

The operation of conditions likely to produce disease in any part of the country has also been the subject of special inquiries made on behalf of the board. Reports in comparatively recent years on shellfish and on "carrier" cases in relation to enteric fever, on the causes of infantile mortality in England and Wales, on the prevalence of poliomyelitis in 1911, and on the relation of flies to disease are instances in point. The board may also make special regulations imposing duties on local authorities or on persons for the prevention of epidemic or endemic disease. As example may be mentioned the regulations, issued by the board in 1911, requiring the notification of cases of pulmonary tuberculosis throughout the country, and prescribing the action to be taken by officers of local authorities in respect of cases so notified. The provision by local authorities of hospital accommodation for cases of infectious sickness receives the special attention of the board; nearly all important boroughs and most urban and rural districts are now provided with isolation hospital accommodation as part of their sanitary equipment. In the case of the tuberculous, institutional provision has now begun to be made by local authorities on a large scale throughout the country in consequence of the provision of the National Insurance Act. The provision of these institutions is subject to their approval by the Local Government Board. In these instances local authorities providing and maintaining dispensaries, sanatoria, and hospitals will receive substantial contributions to their expenses from the insurance funds and from the central exchequer.

INDUSTRIAL HYGIENE.

The central and the local authorities share in the administration of measures concerned with the hygiene of occupation; but great part of this administration, that relating to factories under the factories and workshops act, is undertaken solely by the central department. The observance of the general law and of special rules and regulations (e. g., as to dangerous trades) is secured by inspectors of factories who are appointed by the Home Office, and form a large staff distributed throughout the country under the charge of supervising inspectors. The Home Office also appoint medical men (often the local medical officer of health), who are certifying factory surgeons, and have duties of certifying as to the degree of fitness of children and young persons

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for employment, of investigating accidents and poisoning, of examining persons employed in special occupations, and the like. The department of the chief inspector of factories undertakes inquiries into various conditions affecting the safety and health of the worker. The regulations and orders issued by the Secretary of State are the result of such inquiries, and of the work of special committees, of the decisions of arbitrators, and of other methods of procedure, resorted to with the object of giving the fullest hearing and consideration to all the interests involved. Local authorities are concerned with a few matters relating to the sanitary conditions of factories, and also with the general administration of the law with regard to workshops, which are principally those workshops where no mechanical power is used. Copies of reports on workshop administration by medical officers of health must be sent to the Home Office.

HYGIENE OF SCHOOLS AND HEALTH OF SCHOOL CHILDREN.

The local education authorities in England and Wales (some 320 in number) undertake several branches of school medical work at the public elementary schools. These include medical inspection of school children, organization of medical treatment, sanitation of schools, provision and maintenance of special schools for the defective, physical training, and feeding of school children. The system, which is already of great dimensions, has been organized under the supervision of the Board of Education. The Board of Education, in cooperation with the Local Government Board, have endeavored to coordinate school medical administration as closely as possible with other local sanitary work. Usually, though not invariably, the medical officer of health for the county or the borough is also the school medical officer, having assistant officers for the detailed work; in small districts a medical officer of health may himself do all the work required. The results obtained are communicated to the Board of Education, whose medical officer reviews them in his annual report and indicates the direction in which progress is desirable. Where the responsibility of authorities in respect of school children is divided, the central departments concerned deal with the matter jointly. For example, the practice in regard to measures to prevent the spread of infectious disease in schools is governed by a memorandum issued jointly by the medical officers of the Local Government Board and the Board of Education.

EXOTIC INFECTIOUS DISEASES.

Cases of exotic infectious disease on ships arriving in British ports are isolated in hospitals of the local port or riparian sanitary authorities, and all measures in connection with them are taken by the port or riparian medical officers appointed by those authorities. The

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measures to be taken as regards cases of cholera, yellow fever, and plague are prescribed by regulations of the Local Government Board. Pathological material is examined by bacteriologists appointed by the board, and wherever necessary information is obtained locally by the medical inspectors of the board. The Local Government Board advise the Foreign Office in all matters relating to these diseases in so far as they affect international considerations and the observance of international conventions to which Great Britain is a party.

CONTROL OVER PURITY OF FOOD AND THE PREVENTION OF ADULTERATION.

Administration in this respect rests primarily with local authorities, who act through their various medical officers of health, public analysts, and inspectors. Regulations and circulars for the guidance of these authorities in certain matters are issued by the Local Government Board, who also issue reports of special inquiries made by the inspectors of food in the medical department. The Board of Agriculture exercises direct supervision in regard to margarine factories and certain other places of food preparation, and both that department and the Local Government Board have certain powers enabling them to require local authorities to carry out the provisions of the adulteration acts. Imported foods are examined by the officers of the port and riparian sanitary authorities under regulations of the local Government Board. In the exercise of this duty assistance is rendered to them by the officers of the Board of Customs and Excise. The Government laboratory, at which analytical work is done for all Government departments, reports on foods sent to the laboratory by magistrates who may require chemical evidence in cases of prosecution for adulteration.

CENTRAL RESEARCH WORK.

I have already referred to the epidemiological and bacterial research which is carried on for the Local Government Board by various investigators each year, to the somewhat limited extent permitted by the annual sum allotted by the Treasury. It is anticipated that in the near future, a considerable amount of money will be made available for medical research work, under Government direction, as result of the provisions of the national insurance act. Hitherto, when research work has been undertaken at Government expense on a large scale, it has often been organized and carried out under the direction of specially appointed royal commissioners or departmental committees. The extensive researches conducted by the royal commissions on human and animal tuberculosis and on sewage disposal are recent instances in point.

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From the examples I have given it will be seen that the relation of central departments to local authorities in matters of public health is many sided; in certain instances the central department acts independently; in other instances its function is to regulate, advise, persuade, or even, it may be, to coerce. But it is right and just to add that counsel and guidance are not wholly on the side of the central departments, for the central departments learn much from the practical wisdom and ripe experience of many of our local authorities and the eminent men who are their official advisers and administrators in matters pertaining to the public health of their districts. Many of the best features of the central public health administration of the present day have resulted from the pioneer action of individual local authorities and their expert advisers. Happily, in view of the complexity of the system which I have attempted to outline, it is generally recognized that in no branch of government is the cooperation of all official bodies concerned more necessary than in that concerned with public health administration.

PUBLIC HEALTH ADMINISTRATION FROM THE STANDPOINT OF THE ADMINISTRATIVE COUNTY.

George Reid, M. D., D. P. H., County Medical Officer, Staffordshire, England.

The acts of Parliament under which county councils are given public health powers are so numerous that it is difficult, within the limits of a short article, to convey an idea of the nature of these powers. When county councils were first established by the Local Government (England and Wales) Act, 1888, important administrative duties were intrusted to them in other public departments, but as regards general public health administration the powers conferred by the Act were very limited, and, as it was optional whether they appointed expert public health officers, public health work, except in the case of one or two progressive councils, was allowed to go by default. Still, in the case of these county councils who did make such appointments, it soon became apparent that, limited though their powers were, it was possible to effect a good deal in the way of inducing district councils to pay more regard to questions of public health, and to aim at a higher standard than hitherto had satisfied them. As time went on, and the good which it was possible to effect in counties governed by progressive councils became apparent, the councils of other counties followed suit, and the number who elected to exercise their public health powers gradually increased. From time to time, also, fresh impetus was given to this movement by new legislation, culminating in the passing of the Housing, Town-planning, etc., Act, 1909, which compelled all county councils to

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appoint medical officers of health and empowered the Local Government Board, concurrently with the county councils, to specify the duties of such officers, who were also given security of tenure. This Act, together with the Education (Administrative Provisions) Act which immediately preceded it, for the first time gave county councils a definite locus standi as health authorities, their strictly public-health duties, with a few exceptions to be presently referred to, being previously of an advisory rather than of an executive nature, and their position in the scheme of public health administration being intermediary between the central authority, the Local Government Board, and the urban and rural district councils.

Perhaps the best way of conveying an idea of the present powers of county councils as health authorities is to detail chronologically the statutes under which they act epitomizing the important clauses.

1. *Local Government (England and Wales) Act, 1888.*—As already stated, the direct public health powers conferred by this Act are very limited and are practically confined to the power, which is optional, of appointing a county medical officer of health, and the obligation upon local medical officers of health to send to the county council "a copy of every periodical report of which a copy is for the time being required by the regulations of the Local Government Board to be sent to the Board ———. Upon receipt of such reports, should it appear to the county council that the Public Health Act, 1875, has not been properly put in force within the district to which the report relates, or that any other matter affecting the public health of the district requires to be remedied, the council may cause a representation to be made to the Local Government Board on the matter."

Notwithstanding the apparent meagerness of these powers, in practice they were found to be very serviceable in the few counties which put them into operation.

At the same time, while the general public health powers of county councils were thus restricted, the power given them by the Act to enforce the provisions of the Rivers' Pollution-prevention Acts incidentally strengthened their hands as health authorities, for, compelling district councils to properly dispose of the sewage of their districts involved the provision of efficient sewers, and, consequently, improved house drainage. Under these embodied Acts a vast amount of good work has been accomplished by county councils who early in the day were alive to their responsibilities and provided the needful machinery and staff.

Again, as certain powers hitherto intrusted to quarter sessions were, under this act, transferred to county councils, and as among these powers was included the administration of the Food and Drugs Acts, the duty thus imposed on county councils of the prevention of food adulteration further added to their public health powers.

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2. *Local Government Act, 1895.*—By this Act minor authorities were created in the shape of parish councils with certain limited powers, and, among others, the right of making complaint to the county council when the rural district council had, in their opinion, failed to provide proper sewerage or water supply, or to enforce any provisions of the Public Health Acts within the parish. It was at first hoped that by the exercise of these powers parish councils would enable county councils to bring pressure to bear upon defaulting rural district councils, but, for one reason or another, probably the dread of resulting increase of rates, the Act in this respect has been a dead letter.

3. *Housing of the Working-classes Act, 1890.*—Under this Act a county council may, in the case of rural districts, make representations to a district council who has failed to exercise their powers under the Act as regards the closure of insanitary houses or the pulling down of obstructive buildings, and, should the district council fail to act on the representation, the county council are empowered to take the place of the district council and enforce the needful closure, etc., recovering any cost they may have incurred from the district council. So far, it does not appear that county councils have availed themselves of the powers under this Act, probably because of the scarcity of houses in rural districts and the overcrowding which would frequently result from the wholesale closure of houses without replacing them by others. Reference will be made later on, however, to later legislation which will greatly simplify the condemnation of insanitary property in rural districts.

4. *Isolation Hospital Acts, 1893 and 1901.*—Under these Acts, should district councils fail to make adequate isolation hospital provision, county councils have the power to compel such councils to make such provision and may unite districts for that purpose. The Acts also empower county councils to contribute from county rates such sums as they think fit toward defraying the capital outlay, or toward the annual establishment and maintenance expenses. Advantage has been taken of these Acts by many county councils, with the result that greatly improved accommodation for the hospital isolation of infectious cases is now available.

5. *Midwives Act, 1902.*—Until this Act was passed, any woman was at liberty to call herself a midwife, and practice as such, without possessing any qualification. Under the Act, however, every midwife has now to be certificated and has to conform to certain rules and regulations established by a statutory body, the Central Midwives Board. Locally the Act is administered by county councils and county borough councils, who are known as local supervising authorities, and whose duty it is to provide inspecting officers to act under the county medical officers of health and systematically visit

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the midwives in order to see that they observe the rules and are not guilty of any irregularities. It is the duty of the local supervising authority to inquire into any reported irregularities, and defaulting midwives may either be censured by that body or reported to the central midwives board, who are empowered to remove the names of such midwives from the roll, and thus prevent them from practicing in the future.

The Act has undoubtedly been of service in raising the standard of midwifery work, and, as the older class of women, who were trained by practice two years before the passing of the Act, die out, the standard will still further be raised, as women who have not undergone a training conducted by the central authority.

Education (Administrative Provisions) Act, 1907.—From a public-health point of view the most important Acts which have been passed relating to administration are those relating to education. Provisions relating to education authorities in the education of scholars, and for the medical inspection and health of scholars at stated periods at such times and places as may be prescribed by the Board of Education. Moreover, education authorities are empowered to provide for the medical treatment of children, to see that children attending public elementary schools are in a fit state to profit by the instruction provided for them, and with this object in view to appoint inspectors to specially examine children and to record, on prescribed forms, the result of such treatment. The results of these examinations, the board of education may require to be made during the school life of each child and the other on leaving school—a medical examination will soon be required by the Act.

The administration of the Act is entrusted to county councils, urban districts with populations under 20,000, and boroughs with populations under 10,000 (or, in certain circumstances, boroughs of over 10,000 population and not more than 20,000 population).

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bodies being in constant touch in cases (which constitute the minority) in which the school medical officer and the medical officer of health are not one and the same person.

7. *Housing, Town Planning, etc., Act, 1909.*—Under this Act county councils have extended powers as supervising authorities in respect of housing conditions, but perhaps the most important new element it introduces is the compulsion on county councils to appoint county medical officers of health and the conference upon the local government board of the power, not hitherto possessed by that body, of specifying the duties of such officers.

Perhaps the best way of conveying an idea of the great value of the Act from a county council point of view is to set forth, in detail, the requirements framed by the local government board under the Act as regards the duties of the county medical officers, as follows:

1. The medical officer of health of the county shall inform himself as far as practicable respecting all influences affecting or threatening to affect injuriously the public health in the county. For this purpose he shall visit the several county districts in the county as occasion may require, giving to the medical officer of health of each county district prior notice of his visit, so far as this may be practicable.

2. The medical officer of health of the county shall from time to time inquire into and report upon the hospital accommodation available for the isolation of cases occurring in the county—(*a*) of smallpox, and (*b*) of other infectious diseases, and upon any need for the provision of further hospital accommodation.

3. The medical officer of health of the county shall communicate to the medical officer of health of a county district within the county any information which he may possess as to any danger to health threatening that district.

4. The medical officer of health of the county shall consult with the medical officers of health of county districts within the county whenever the circumstances may render this desirable.

5. If the annual or special reports of the medical officer of health of a county district in the county shall not contain adequate information in regard to (*a*) the vital statistics of the district, (*b*) the sanitary circumstances and administration of the district, and (*c*) the action taken in the district for putting in force the provisions of the Housing of the Working Classes Acts, 1890 to 1909, the medical officer of health of the county shall obtain from the medical officer of health of the county district such further information on those matters as the circumstances may demand.

6. The medical officer of health of the county shall, when directed by us, or by the county council, or as occasion may require, make a special report to the county council on any matter appertaining to his duties under this Order.

7. The medical officer of health of the county shall as soon as practicable after the 31st day of December of each year make an annual report to the county council up to the end of December on the sanitary circumstances, the sanitary administration, and the vital statistics of the county.

In addition to any other matters upon which the medical officer of health may consider it desirable to report, his annual report shall contain the following sections: (*a*) A digest of all annual and special reports made by the medical officers of health of all county districts within the county; (*b*) a section as to the isolation-hospital accommodation available for each county district and as to the steps which should be taken to remedy any deficiencies which may exist; (*c*) a section on the administration of the Housing of the Working Classes Acts, 1890 to 1909, within the county; (*d*) a section on the water supply of the several county districts within the county; (*e*) a

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section on the pollution of streams within the county and as to the steps for the prevention of pollution taken (1) by local authorities and (2) by the county council; (*f*) a section on the administration within the county of the Midwives Act, 1902; and (*g*) a section on the administration of the Sale of Food and Drugs Acts, 1875 to 1907, within that part of the county in which the county council have jurisdiction for the purposes of those Acts.

8. The medical officer of health of the county shall send to us two copies of his annual report and two copies of any special report; he shall also send one copy of his annual report to the council of every county district in the county and shall send three copies of any special report to the council of every such county district affected by the special report.

8. *National Insurance Act, 1911.*—In all probability it is not overstating the position to say that, valuable though some recent legislative enactments are from a public health point of view, this Act, which, so far as medical benefits are concerned, has not yet come fully into operation, will prove to be most potent for good in that direction. The fact that the Act aims at insuring that all insured persons, if not their dependents also, shall be provided with adequate medical treatment, and seeing that their hygienic surroundings are kept up to a reasonable standard, is in itself very valuable, but perhaps the most valuable feature of the act is the provision it makes for the preventive treatment of tuberculosis, toward which substantial Government grants will be made and an annual sum apportioned for research work. County councils and county borough councils, either singly or jointly, are the authorities to whom the duty of providing the needful machinery for dealing with tuberculosis has been intrusted, under a masterly scheme which was drafted by a specially appointed departmental committee. The keenness with which county councils have accepted the responsibility of making the needful provision, and the energy many of them have already displayed in drafting schemes suitable to varying local requirements, lend encouragement to hopeful anticipations of success.

I hope that the above short summary of the public health powers of county councils will enable those who are unfamiliar with the laws governing public health procedure in England to form an idea of the part played by these intermediary bodies in the general scheme. It will be gathered that, while county councils, as far as general public health administration is concerned, act very largely as supervisory bodies, for certain purposes—for example, rivers pollution, food and drugs, midwives, school medical inspection, and tuberculosis prevention—they are intrusted with important executive duties which, even if their responsibilities ended there, would entitle them to claim a high place in the somewhat complex scheme of sanitary government. They have earned the confidence the Government has placed in them by good work, and there are indications that their responsibilities will be still further extended in the immediate future.

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MEMORANDUM INDICATING THE METHOD OF SANITARY ADMINISTRATION OF A LARGE CENTER OF POPULATION IN ENGLAND.

E. W. Hope, M.D., D.Sc., medical officer of health for the city and port of Liverpool.

The sanitary administration of the cities and towns of England is vested in the governing body known either as the town council or the city council, and also described as the sanitary authority. The council of the city of Liverpool consists of 137 members. The city is divided into 34 wards. Thirty-three of the wards are represented by three councilors and one alderman each. One other ward of a semirural character is represented by one councilor only. The councilors are elected by the people and remain in office for three years. The councilors elect the aldermen, generally from their own body, but not necessarily so, and the aldermen sit for six years. The lord mayor is chosen by the council each year and takes office on November 9. He may or may not be a councilor or alderman. No member of this governing body receives any payment.

The sanitary obligations of the council are to administer all the acts of Parliament relating to public health, and while some of these acts are compulsory over the whole country, others are permissive and only come into operation if the council decide to adopt them.

The city council acts through committees, but proceedings of all committees are subject to confirmation by the council, which usually meets once per month on a stated date.

The principal committee dealing with public health matters is the Health Committee, and the Acts of Parliament which have been delegated by the council to this committee to carry into effect may be set forth as follows, viz:

The Liverpool sanitary act, 1846 (except so much as relates to the appointment of collectors of rates and water rents); the Liverpool sanitary amendment act, 1854; section 36 of the Liverpool corporation waterworks act, 1866; the Liverpool improvement act, 1867; the Liverpool improvement and waterworks act, 1871; the infant life protection acts, 1872 and 1897; the factory steam whistles act, 1872; the sale of food and drugs acts, 1875 to 1899; the Liverpool Hydraulic Power Co.'s acts, 1872 and 1884; the public health act, 1875 (except such provisions as refer to hospitals); the rivers pollution prevention acts, 1876 and 1893; the destructive insects act, 1877; the canal boats acts, 1877 and 1884; the locomotives acts, 1861 and 1865; the highways and locomotives (amendment) act, 1878; the factory and workshop acts, 1878 and 1883; the telegraph act, 1878; section 48 of the merchant seamen (fishing boats) act, 1883; the disused burial grounds act, 1884; the public health (ships, etc.) act, 1885; the quarry (fencing) act, 1887; the Liverpool improvement acts, 1882, 1883, and 1885; the public health (buildings in streets) act, 1888; the sale of horseflesh, etc., regulation act, 1889; the infectious disease (notification) act, 1889; the advertising stations (rating) act, 1889; the Liverpool corporation act, 1889; the Liverpool corporation act, 1890; the infectious disease (prevention) act, 1890; the public health acts amendment act, 1890; the factory and workshop act, 1891; the

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private street works act, 1892; the telegraph act, 1892; the fertilizers and feeding stuffs act, 1893; the Liverpool corporation act, 1893; the notices of accidents act, 1894; the diseases of animals act, 1894; and all other acts and parts of acts relating to this subject; the shop hours acts, 1892, 1895, and 1904; the factory and workshop acts, 1895, 1901, and 1907; the local Government board's provisional order confirmation (No. 10) act, 1895; the locomotives on highways act, 1896, so far as it relates to matters coming within the province of the health committee; the local Government board's provisional orders confirmation (No. 17) act, 1896; cleansing of persons act, 1897; the local Government board's provisional orders confirmation (No. 15) act, 1897; Liverpool corporation act, 1898; Liverpool corporation act, 1900; local Government board's provisional orders confirmation (No. 4) act, 1901; and the local Government board's provisional orders confirmation (No. 12) act, 1901; Liverpool corporation act, 1902; Liverpool (extension) order, 1902; midwives act, 1902; diseases of animals act, 1903; employment of children act, 1903; prevention of cruelty to children act, 1904; Liverpool corporation (general powers) act, 1905; local Government board's provisional orders confirmation (No. 12) act, 1905; the alkali, etc., works regulation act, 1906; the fertilizers and feeding stuffs act, 1906; destructive insects and pests act, 1907; butter and margarine act, 1907; advertisement regulation act, 1907; public health (regulations as to food) act, 1907; public health acts amendment act 1907 (Part I); notification of births act, 1907; Liverpool corporation (general powers) act, 1908; telegraph (construction) act, 1908; Liverpool corporation (streets and buildings) act, 1908; poisons and pharmacy, act, 1908; children act, 1908; Liverpool corporation act, 1909; telegraph (arbitration) act, 1909; diseases of animals acts, 1909 and 1910; cinematograph act, 1909; housing, town planning, etc., act, 1909 (as far as it relates to the health committee); development and road improvement funds acts, 1909 and 1910; poultry act, 1911.

In addition to acts of Parliament which apply all over the country, many, if not most, of the cities and towns in England have applied to Parliament for special powers to meet exceptional local conditions. Liverpool, for example, has been prominent in initiating powers to meet difficulties which have arisen in administration, such as the housing of the poorer classes, the milk supply, local improvements such as the compulsory widening of central thoroughfares, the closing of cellars as separate dwelling places, the keeping of animals, the sale of ice cream, the provision of a town water supply, etc. Some of these acts give the council power to make by-laws and regulations to control certain sanitary matters.

The health committee in its turn appoints out of its number certain subcommittees to supervise various branches of the work, and the principal duties are indicated on the appended charts. The proceedings of all its subcommittees are subject to confirmation by the health committee.

The actual work is carried out in different departments of the corporate service, the head of each department reporting directly to the committee under which he serves. The departments under the health committee are as follows, viz, medical officer of health, city engineer, building surveyor, and veterinary superintendent. The town clerk acts as the clerk to the committee and supervises the legal work. The city treasurer and controller of accounts is respon-

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sible to the committee for the financial affairs and the receipt and payment of all moneys.

The medical officer of health and the chief sanitary inspector are officers appointed in accordance with the provisions of an act of Parliament, and can not be removed from office except with the consent of the local Government board. Their salaries are paid from city funds, but half of the amount is refunded by a Government contribution, and they are responsible both to the city council and to the Government for the proper performance of their duties, and reports are called for from time to time from these officers as to any unusual condition of health or sickness which may arise in the city. The medical officer of health is the person to whom complaints may be addressed as to any unhealthy condition which may arise, and he is bound by law to record such complaint, and the result of the sanitary inspection which must follow.

The office of city medical officer is one dating back only about 60 years, and Liverpool was the first town in England to inaugurate such an official. Since that time Parliament has made him responsible for innumerable provisions relating to the public health, and each year his duties and responsibilities are increased. This being so, it is essential that he should have an adequate staff to undertake the special duties imposed by different acts of Parliament.

Liverpool had a population of 746,566 at the census of 1911, and the area of the city is 16,619 acres, equal to 26 square miles.

The duties of medical officer of health to such a city as Liverpool are very onerous, and consequently three assistant medical officers have been appointed; and although various branches of the work are allocated to each assistant, they may all be called upon to assist in any special matters which urgently call for attention. The chief assistant medical officer acts as deputy, and is responsible for sanitary inspections, outbreaks of infectious disease, supervision of midwives, and such like. Another assistant has charge of the food-inspection staff, the sampling officers, and the milk supply. The third assistant practically devotes the whole of his time to tuberculosis.

The principal outdoor officer is the chief sanitary inspector, and he undertakes the supervision of a large staff of sanitary inspectors, the conduct of prosecutions in the police court, and furnishes the clerical staff with all reports which are made to him, as well as other records and statistics relating to the work done. He confers with the medical officer of health daily, and receives instructions in regard to all sanitary operations in which he may be engaged, and the daily routine work of investigations into cases of infectious disease.

A permanent staff of 25 clerks is engaged in keeping the records required by the health committee and the Government departments.

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The chief clerk is directly responsible to the medical officer of health for the proper conduct of this work.

A full list of the staff employed is given as follows, viz:

Chief sanitary inspector	1
Deputy chief sanitary inspector	1
Prosecuting sanitary inspectors	7
Inspectors for general sanitary purposes	31
Inspectors of ash pits and ash bins	2
Female inspector for general sanitary purposes	21
Female inspector of midwives	1
Female inspector for ophthalmia neonatorum	1
Female superintendent of humanized-milk depots	1
Female assistants at humanized-milk depots	26
Inspectors of meat and animals	5
Inspectors under the diseases of animals act	7
Inspectors of fish and fruit	4
Inspectors under the sale of food and drugs act	3
Inspectors under the workshop and shop hours acts	3
Inspectors, smoke	3
Inspectors, removing patients and infected bedding and disinfecting infected houses, etc	11
Superintendent of ambulance staff	1
Superintendents of disinfecting apparatus	2
Superintendent of disinfecting and wall-paper stripping staff	1
Men engaged on wall-paper stripping staff	25
Chief inspector of common lodging and sublet houses	1
Inspectors of common lodgings and sublet houses	15
Inspector of canal boats	1
Inspector of bakehouses	1
Inspectors of cow sheds and milk shops	2
Notice servers	3
Clerical staff	25

The officers employed in the health department are all specially trained and qualified and, generally speaking, have been engaged in the one class of work from their youth up. For practically every post it is essential that candidates should produce evidence by diploma or certificate that they have undergone a proper course of instruction and passed an examination.

One of the functions of the Liverpool University is the teaching of hygiene in all its branches, so that there is no difficulty in getting trained officers to fill the various posts as they become vacant.

The pay of junior sanitary officers commences at 35 shillings per week, with uniform provided, and small increases are given on the completion of satisfactory service at 1 year, 3 years, 5 years, 7 years and 10 years, the rate then being 45 shillings per week; the officer is then eligible for one of the higher appointments with salary ranging from £120 to £150 per annum. After that special officers receive varying amounts up to £300 per annum.

Another branch of the health committee's work is the analytical department, the principal duty of which is the examination by chem-

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ical analysis of the various foods and drugs which are on sale in the city. Over 2,000 samples are examined yearly, and if any are found to be adulterated or harmful to the consumer proceedings are taken against the vendor. In addition, the city analyst makes systematic examinations of the water from each of the different sources of supply, and also from dwelling houses throughout the city. Many other sundry samples are examined during the year. The city bacteriologist also has very important duties to perform. He is a joint officer of the health committee and the Liverpool University, holding the chair of bacteriology at the university whilst acting as city bacteriologist. He is largely concerned with the examination of milk both from cows within and without the city, but in addition he also examines a large number of other foodstuffs. A systematic bacteriological examination of the water supply is also carried out daily, investigations are made for the city hospitals, and about 3,000 rats are reported on yearly. Some of the rats come from premises and sewers within the city, but the majority are caught on board ships arriving from all parts of the world.

Closely allied with the city health work is the preventive work of the port sanitary authority. The cost of this branch is distributed between the various sanitary authorities whose districts abut on the River Mersey. The city of Liverpool contributes about 80 per cent of the cost. The medical officer of health is also the medical officer to the port sanitary authority, and is assisted in this work by three assistant medical officers, two of whom are engaged in tidal inspection work and the general sanitary supervision of ships arriving in the port, and the third devotes most of his time to the inspection and supervision of the meat and foodstuffs arriving in the port. Liverpool is a great distributing center for the whole of the United Kingdom, and vast quantities of foodstuffs are brought from the colonies and other countries.

The detailed sanitary work is carried on by six inspectors, all of whom have a practical acquaintance with shipping and seafaring life as well as holding certificates of sanitary knowledge. The food inspection is performed by a staff of six inspectors, most of them practical butchers reared in the abattoirs, or having other special acquaintance with grains or fruits, and all holding certificates of competency. Patients arriving in the port suffering from dangerous infectious diseases are transshipped on to a tugboat in the river and landed at the port hospital jetty, which runs down to the water in a sheltered part of the river, above the actual residential parts.

Five years ago Parliament added another important duty on the city council, viz, the medical inspection of school children. The medical officer of health was appointed to control this work, which was to be carried out under the auspices of the education committee, one of the largest committees of the city council, and one, moreover, which

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is peculiar in that some of the members are not popularly elected, but are coopted on the committee direct, usually on account of their expert knowledge of educational matters. The actual inspection of the school children is carried on by five assistant medical inspectors, who receive salaries of £250 to £325 per annum for this work, to which they devote all their time. They are assisted by five inspectors of the female sanitary staff of the health committee, who are specially qualified to undertake this duty. Where children appear to be neglected or badly nourished, the female inspector makes a domiciliary visit, and gives such advice and counsel to the parents as may appear desirable. Difficult cases are reported direct to the medical officer of health, and taken up by the health committee's staff and the Society for the Prevention of Cruelty to Children. No less than 130,000 children are in attendance at the elementary schools of the city, and about 26,000 of this number are examined annually. The practice has been to deal with those entering school life and those about to complete the curriculum, i. e., in their thirteenth or fourteenth year.

The medical inspection of the children has brought about a very marked improvement in their general condition, but many are still found in a dirty or verminous state, and under a recent act a notice is served on the parents requiring them to remedy this condition. In case of default the children are taken from school and cleansed at the corporation cleansing depot. The parents are then liable to be brought before the magistrates if the children are allowed to relapse into their former condition.

The other departments under the health committee are all closely linked with the medical and sanitary service. For instance, the plans of all new buildings are submitted to the building surveyor, who examines them to see that they conform to the acts and by-laws regulating the erection of buildings, and who, if necessary, confers with the medical officer of health on any special circumstance which may arise. The actual erection is supervised by the staff of inspectors under the building surveyor.

The city engineer's department is also closely allied to the medical service. The work is divided into four branches, each with a capable assistant, viz, roads, sewerage, scavenging, and mechanical work, such as destructors, erections, etc.

The veterinary superintendent and his assistant devote their whole time to the care of a large stud of horses belonging to the corporation, the inspection of animals at the cattle markets, which are held at frequent intervals in the city, the inspection of cows in city shippons, and suspected cows on farms beyond the city boundaries, but sending milk in for human consumption. They are sometimes called upon to advise in cases of suspected rabies, glanders, swine fever, and other diseases common to animals.

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CITY OF LIVERPOOL.

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SUMMARY OF COMMITTEES DEALING WITH THE HEALTH ADMINISTRATION OF THE CITY.

Charts.

1. THE CITY COUNCIL, Committees of
2. HEALTH COMMITTEE, Operations of
3. HEALTH COMMITTEE, Sub-Committees of
4. PORT SANITARY & HOSPITALS COMMITTEE, Operations of
5. HOUSING COMMITTEE, Operations of
6. EDUCATION COMMITTEE, Sub-Committees of
7. MEDICAL INSPECTION SUB-COMMITTEE, Operations of

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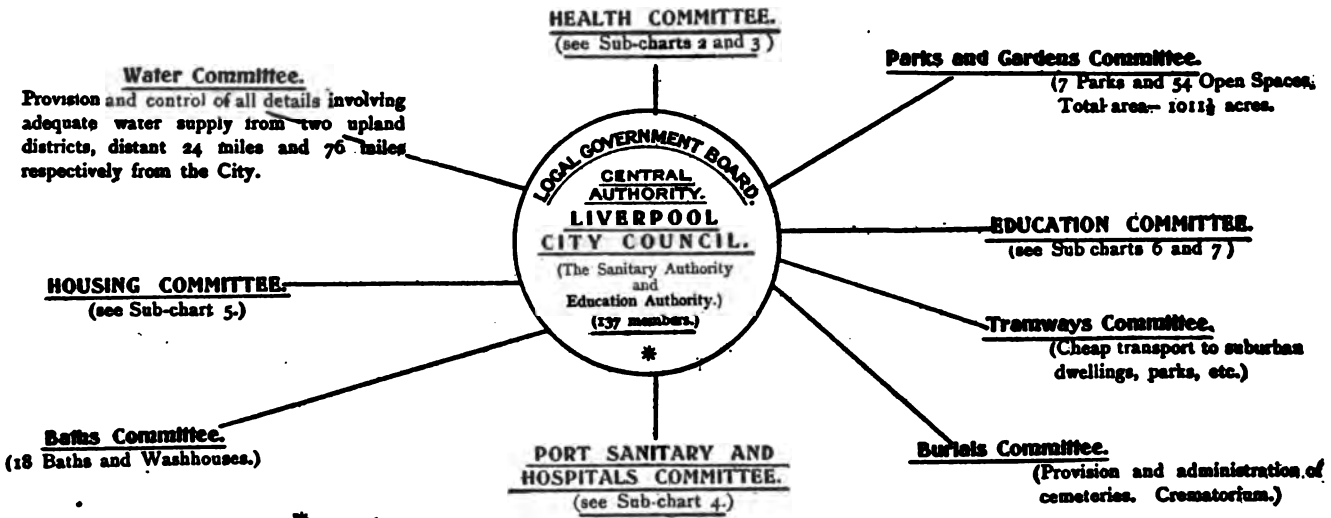
CITY OF LIVERPOOL.

CHART 1.

SHOWING COMMITTEES OF THE CITY COUNCIL DEALING WITH THE HEALTH ADMINISTRATION OF THE CITY.


HEALTH COMMITTEE.
(see Sub-charts 2 and 3)
Water Committee.
Provision and control of all details involving adequate water supply from two upland districts, distant 24 miles and 76 miles respectively from the City.
Parks and Gardens Committee.
(7 Parks and 54 Open Spaces. Total area.- 1011½ acres.
LOCAL GOVERNMENT BOARD.
CENTRAL AUTHORITY.
LIVERPOOL CITY COUNCIL.
(The Sanitary Authority and Education Authority.)
(157 members.)
*
EDUCATION COMMITTEE.
(see Sub charts 6 and 7)
HOUSING COMMITTEE.
(see Sub-chart 5.)
Tramways Committee.
(Cheap transport to suburban dwellings, parks, etc.)
Baths Committee.
(18 Baths and Washhouses.)
PORT SANITARY AND HOSPITALS COMMITTEE.
(see Sub-chart 4.)
Burials Committee.
(Provision and administration of cemeteries. Crematorium.)

* NOTE.—The Medical Officer of Health for the City and Port—who acts also as Medical Officer to the Education Authority—advises on all health and sanitary matters.

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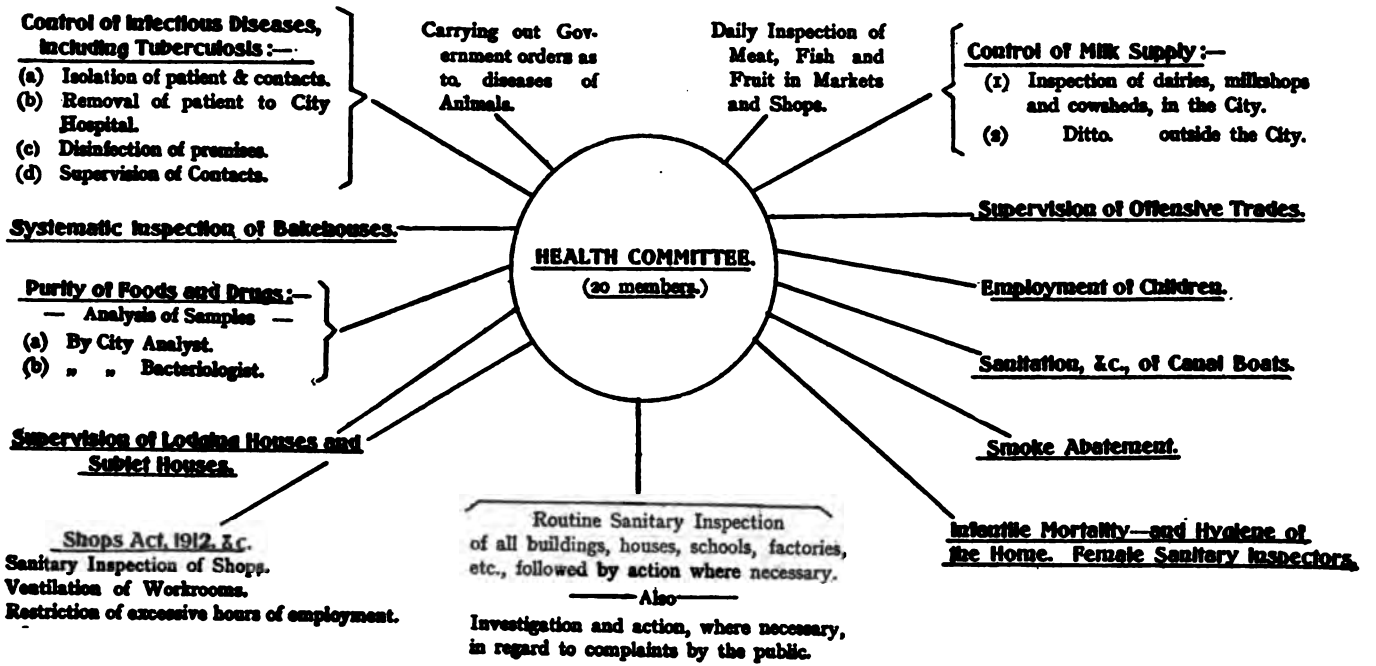
CITY OF LIVERPOOL.

CHART 2.

SHOWING OPERATIONS OF THE HEALTH COMMITTEE.


Control of Infectious Diseases, including Tuberculosis:—
(a) Isolation of patient & contacts.
(b) Removal of patient to City Hospital.
(c) Disinfection of premises.
(d) Supervision of Contacts.
Carrying out Government orders as to diseases of Animals.
Daily Inspection of Meat, Fish and Fruit in Markets and Shops.
Control of Milk Supply:—
(1) Inspection of dairies, milkshops and cowsheds, in the City.
(2) Ditto. outside the City.
Systematic Inspection of Bakehouses.
Supervision of Offensive Trades.
HEALTH COMMITTEE.
(20 members.)
Purity of Foods and Drugs:—
— Analysis of Samples —
(a) By City Analyst.
(b) „ „ Bacteriologist.
Employment of Children.
Sanitation, &c., of Canal Boats.
Supervision of Lodging Houses and Sublet Houses.
Smoke Abatement.
Infantile Mortality—and Hygiene of the Home. Female Sanitary Inspectors.
Shops Act, 1912, &c.
Sanitary Inspection of Shops.
Ventilation of Workrooms.
Restriction of excessive hours of employment.
Routine Sanitary Inspection of all buildings, houses, schools, factories, etc., followed by action where necessary.
—Also—
Investigation and action, where necessary, in regard to complaints by the public.

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CITY OF LIVERPOOL.

CHART 3.

SHOWING OPERATIONS OF THE SUB-COMMITTEES OF THE HEALTH COMMITTEE.

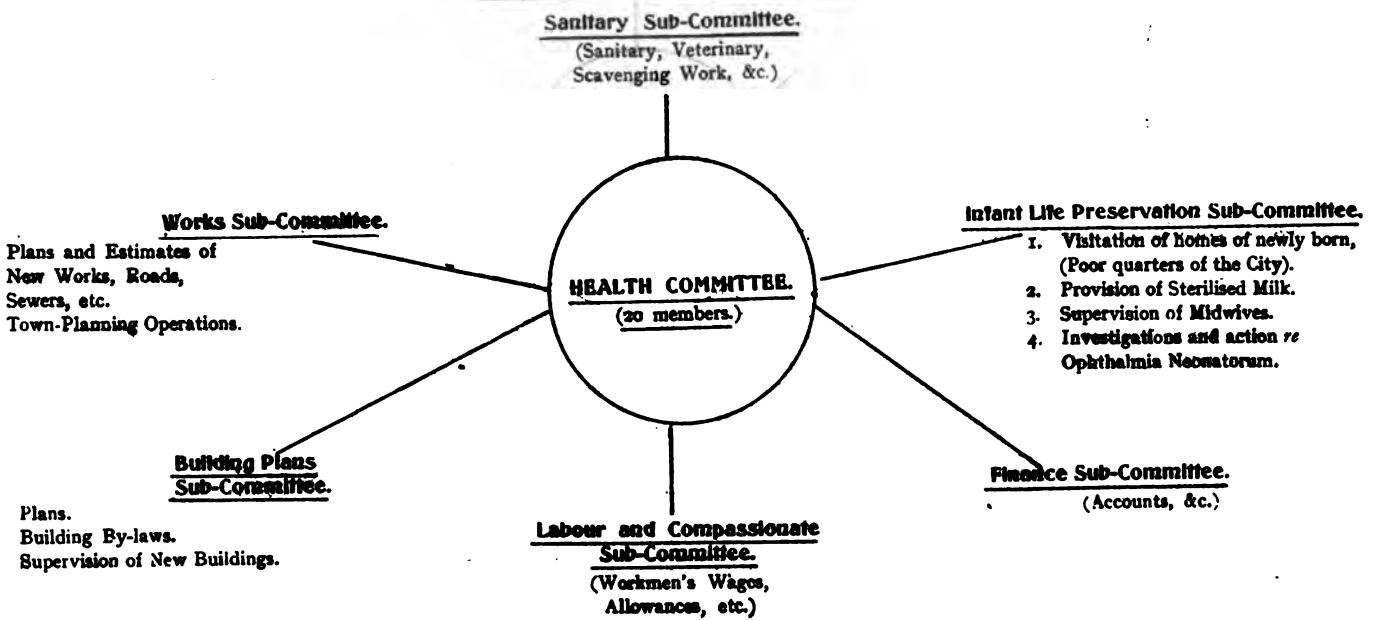

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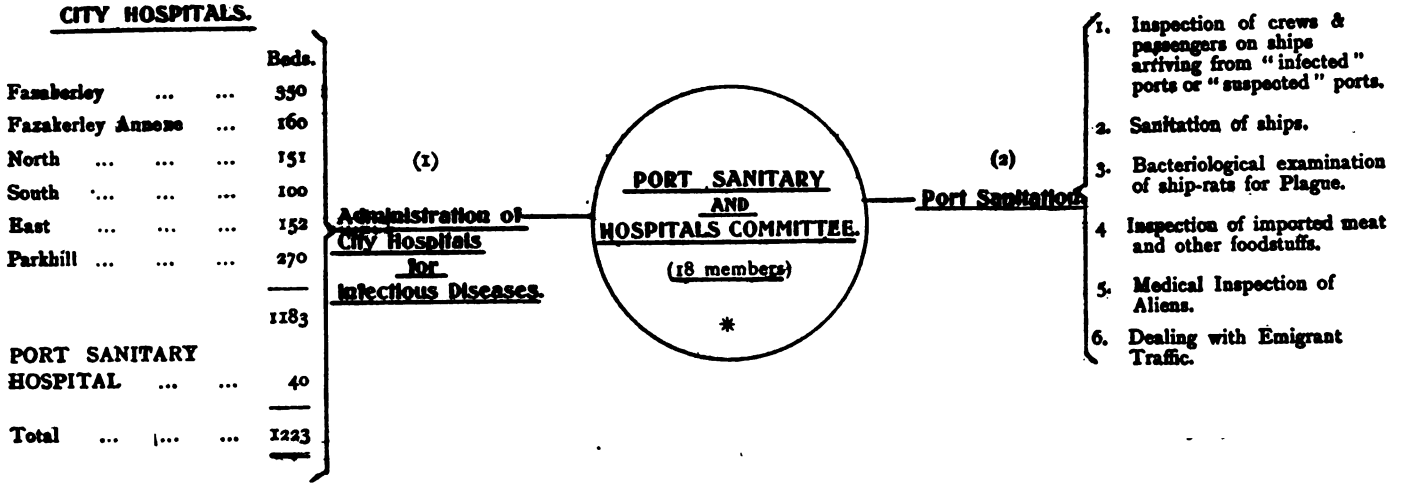
CHART 4.

SHOWING OPERATIONS OF THE PORT SANITARY AND HOSPITALS COMMITTEE.


CITY HOSPITALS.
Beds.
Fazakerley 350
Fazakerley Annexe ... 160
North 151
South 100
East 152
Parkhill 270
1183
PORT SANITARY HOSPITAL 40
Total 1223
(1)
Administration of City Hospitals for Infectious Diseases.
PORT SANITARY AND HOSPITALS COMMITTEE.
(18 members)
(2)
Port Sanitation.
1. Inspection of crews & passengers on ships arriving from "infected" ports or "suspected" ports.
2. Sanitation of ships.
3. Bacteriological examination of ship-rats for Plague.
4 Inspection of imported meat and other foodstuffs.
5. Medical Inspection of Aliens.
6. Dealing with Emigrant Traffic.

NOTE.—The Medical Officer of Health for the City also acts as Medical Officer of Health to the Port Sanitary Authority.

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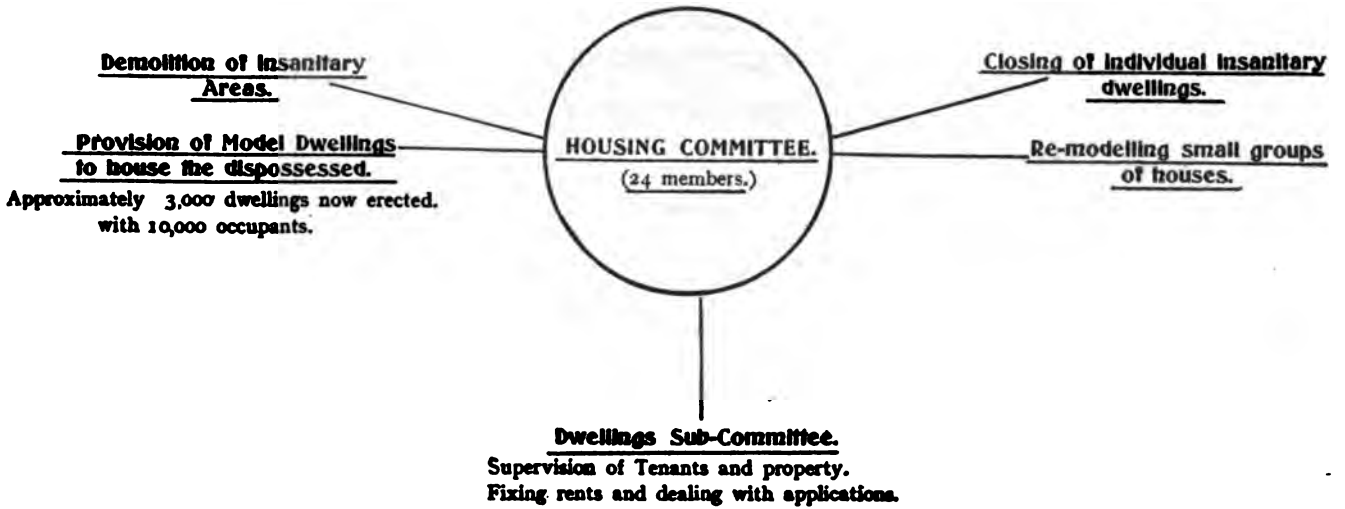
CHART 5.

SHOWING OPERATIONS OF THE HOUSING COMMITTEE.


Demolition of Insanitary Areas.
Provision of Model Dwellings to house the dispossessed.
Approximately 3,000 dwellings now erected.
with 10,000 occupants.
HOUSING COMMITTEE.
(24 members.)
Closing of individual insanitary dwellings.
Re-modelling small groups of houses.
Dwellings Sub-Committee.
Supervision of Tenants and property.
Fixing rents and dealing with applications.

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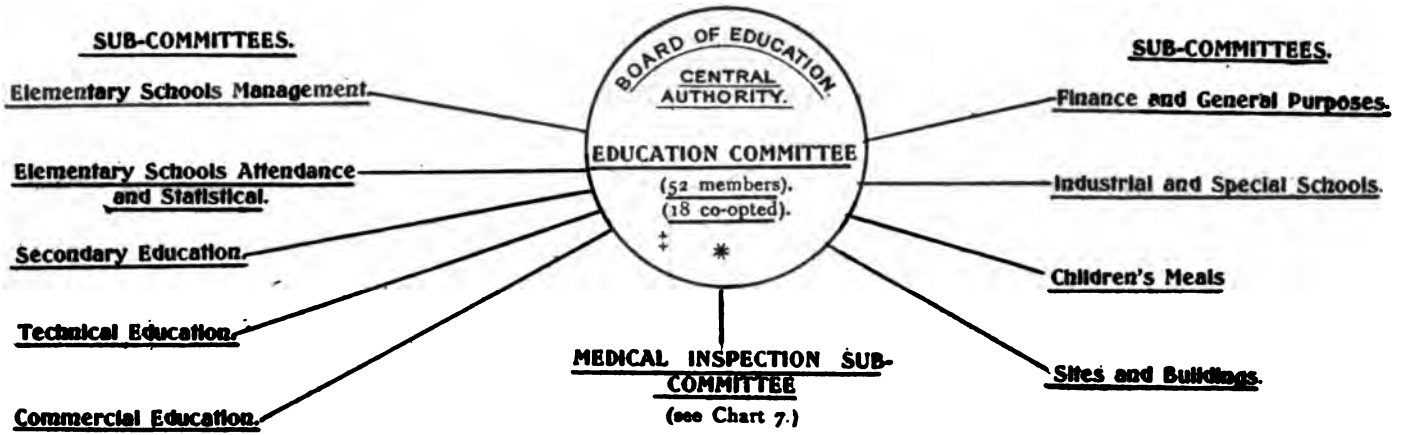
CITY OF LIVERPOOL.

CHART 6.

SHOWING SUB-COMMITTEES OF THE EDUCATION COMMITTEE.



‡ The City Council is the Local Education Authority, and deputes its duties to the Education Committee.

* NOTE.—The Medical Officer of Health for the City and Port, also acts as Medical Officer to the Education Authority.

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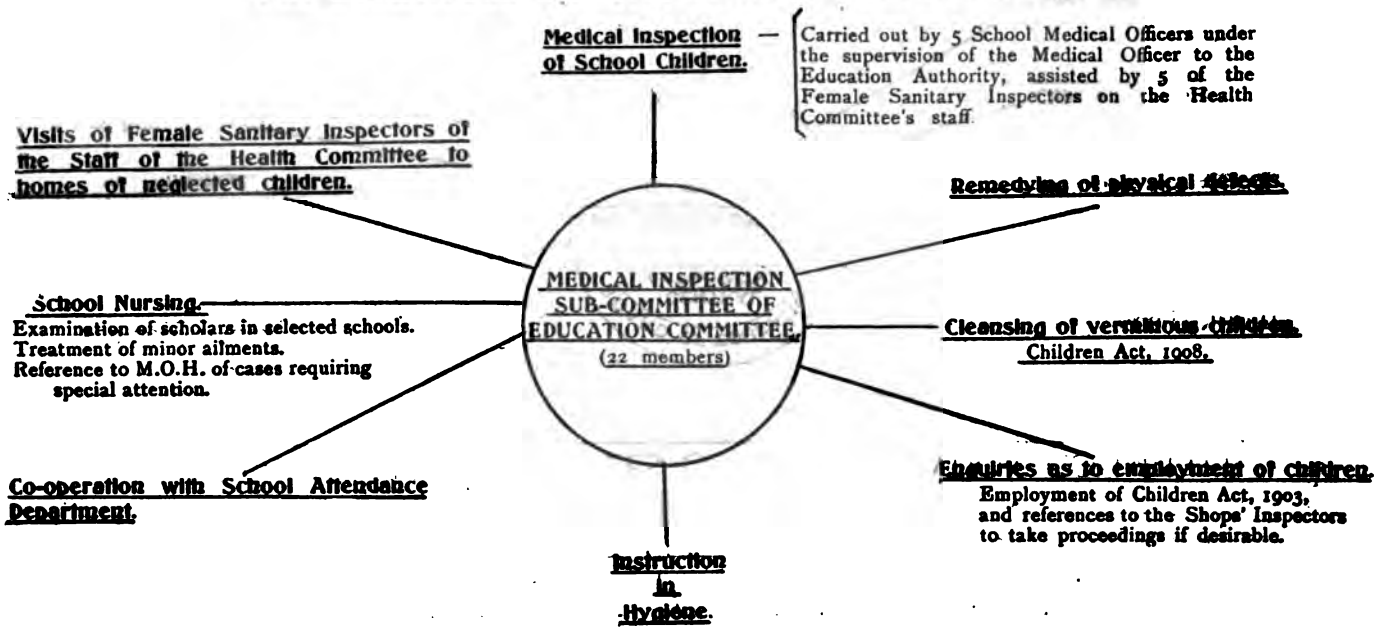
CITY OF LIVERPOOL.

CHART 7.

SHOWING OPERATIONS OF THE MEDICAL INSPECTION SUB-COMMITTEE OF THE EDUCATION COMMITTEE.


Medical Inspection of School Children.
Carried out by 5 School Medical Officers under the supervision of the Medical Officer to the Education Authority, assisted by 5 of the Female Sanitary Inspectors on the Health Committee's staff.
Visits of Female Sanitary Inspectors of the Staff of the Health Committee to homes of neglected children.
Remedying of physical defects.
School Nursing.
Examination of scholars in selected schools.
Treatment of minor ailments.
Reference to M.O.H. of cases requiring special attention.
MEDICAL INSPECTION SUB-COMMITTEE OF EDUCATION COMMITTEE.
(22 members)
Cleansing of verminous children.
Children Act, 1908.
Co-operation with School Attendance Department.
Enquiries as to employment of children.
Employment of Children Act, 1903, and references to the Shops' Inspectors to take proceedings if desirable.
Instruction in Hygiene.

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DIE FÜRSORGE FÜR DAS ÖFFENTLICHE GESUNDHEITSWESEN IM DEUTSCHEN REICH.

Dr. A. Weber, Geheimer Regierungsrat Direktor im Kaiserlichen Gesundheitsamt, Berlin.

Die politische und nationale Vereinigung der Deutschen Staaten, die unter dem Namen "Deutsches Reich" am 18. Januar 1871 erfolgte, umfasst 25 Bundesstaaten und das Reichsland Elsass-Lothringen. Vor der Entstehung des Deutschen Reiches waren die deutschen Einzelstaaten auf dem Gebiete der öffentlichen Gesundheitspflege und der Medizinalpolizei völlig selbständig. Die Verfassung welche das neu erstandene Deutsche Reich am 16. April 1871 sich gab, sah für die Zukunft die Möglichkeit einer Zentralisierung der Fürsorgetätigkeit auf dem Gebiete des Gesundheitswesens vor, indem sie in Artikel 4, Nummer 15, zum Ausdruck brachte, dass die Massregeln der Medizinal- und Veterinär-Polizei der Beaufsichtigung seitens des Reichs und seiner Gesetzgebung unterliegen. Bei der Aufnahme dieser Bestimmung in die Reichsverfassung war die Erwägung massgebend, dass in einem nach innen und aussen einheitlichen Verkehrs-, Produktions- und Absatzgebiet, wie es das Deutsche Reich darstellt, wirksame Massnahmen zur Abwehr und Bekämpfung von Seuchen, wie überhaupt zur Förderung der Volksgesundheit in der Regel nur dann getroffen werden können, wenn sie nach gleichartigen Gesichtspunkten erlassen und gleichmässig zur Ausführung gebracht werden.

Verfassungsgemäss ist also die Zuständigkeit des Reichs für jede Massregel, welche das Gebiet der Medizinal- und Veterinärpolizei berührt, gegeben. Tatsächlich hat aber das Reich noch eine Reihe von Fragen auf dem Gebiete der Gesundheitspflege—die Veterinärangelegenheiten scheide ich als nicht hierher gehörig von meinem Vortrage aus—den einzelnen Bundesstaaten überlassen und sich zunächst nur mit den wichtigsten Aufgaben der Gesundheitsfürsorge und der Seuchenabwehr befasst. Im Laufe der Jahre hat diese Betätigung der Reichsgewalt in Gesetzgebung und Verwaltung freilich zugenommen und immer mehr Gegenstände der reichsrechtlichen Regelung unterworfen. Trotzdem gibt es eine nicht unerhebliche Anzahl von Materien, die gegenwärtig noch der Fürsorge der Regierungen der Einzelstaaten überlassen sind.

Mir liegt heute die ehrenvolle Aufgabe ob, Ihnen darzulegen, inwieweit die Reichsgewalt bisher Gesundheitsmassnahmen in Deutschland getroffen hat; nach mir wird mein Landsmann Regierungs- und Medizinalrath Herr Schneider von dem Beispiel von Preussen schildern, inwieweit in meinem Deutschen Vaterland die Bundesstaaten und die Provinzialverwaltungen, Herr Kreisarzt Kirstein, in welcher Weise die grossen Städteverwaltungen sich auf dem Gebiete der Medizinalpolizei betätigen.

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Die Regelung gesundheitlicher Fragen erfolgt teils unmittelbar auf dem Wege der Gesetzgebung, des Erlasses Kaiserlicher oder bundesrätlicher Verordnungen und des Erlasses von Verwaltungsanordnungen des Reichskanzlers oder mittelbar auf dem Wege der Vereinbarungen im Bundesrat über den Erlass gleichlautender oder gleichmässiger Vorschriften durch die Regierungen der einzelnen Bundesstaaten.

Der Vollzug der Gesetze und Verordnungen erfolgt in der Regel durch die Beamten und Behörden der Einzelstaaten.

Der Reichsgewalt steht die Ueberwachung des Vollzugs zu. In besonderen Fällen werden Reichskommissare zur Sicherung eines einheitlichen Gesetzesvollzugs ernannt.

Das Eingreifen der Reichsverwaltung in die öffentliche Gesundheitspflege führte zur Errichtung einer technischen Zentralbehörde, des Kaiserlichen Gesundheitsamts, welches dem Reichskanzler (Reichsamt des Innern) unmittelbar untergeordnet ist und einen beratenden Charakter trägt.

Das Kaiserliche Gesundheitsamt ist Ende April 1876 ins Leben getreten. Ihm liegt ob, die Reichsverwaltung in der Ausübung und Vorbereitung gesundheitspolizeilicher Massnahmen zu unterstützen, deren Wirkungen zu beobachten, in geeigneten Fällen den Behörden gutachtliche Auskunft zu erteilen, die Entwicklung der gesundheitspolizeilichen und Medizinalgesetzgebung ausserdeutscher Länder zu verfolgen und eine medizinische Statistik für Deutschland herzustellen. Um den gesteigerten Anforderungen gerecht zu werden, vor allem um durch eigene experimentelle Arbeiten wissenschaftliche Forschungsergebnisse zu ergänzen und nachzuprüfen, ist das Gesundheitsamt mit Laboratorien ausgestattet, deren Zahl und Arbeitskreis fortdauernd wachsen.

Dem Kaiserlichen Gesundheitsamt zur Seite steht der Reichs-Gesundheitsrat, der auf allen Gebieten des öffentlichen Gesundheitswesens die verbündeten Regierungen mit Rat und Tat unterstützt.

Fortlaufende Bekanntmachungen über den Gesundheitszustand und die Verbreitung von Seuchen unter Menschen und Tieren bringen die wöchentlich erscheinenden "Veröffentlichungen des Kaiserlichen Gesundheitsamtes," in denen auch unter andern die auf dem Gebiete der Gesundheitspflege getroffenen amtlichen Massnahmen, sowie (in einer Beilage) die einschlägige Rechtsprechung gesammelt werden.

Seine wissenschaftlichen Untersuchungen veröffentlicht das Kaiserliche Gesundheitsamt in den "Arbeiten aus dem Kaiserlichen Gesundheitsamt" und seine grösseren statistischen Arbeiten in den "Medizinalstatistischen Mitteilungen aus dem Kaiserlichen Gesundheitsamt."

Nachdem das Kaiserliche Gesundheitsamt Ende April 1876 in das Leben getreten war, musste es seine erste Aufgabe sein, als Grundlage für die praktischen Massnahmen eine einheitliche Medizinalstatistik

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für das Deutsche Reich zu schaffen, insbesondere den Sterblichkeitsverhältnissen seiner Bewohner besondere Aufmerksamkeit zuzuwenden. Es gelang eine Statistik der Bevölkerungsvorgänge für Orte mit 15,000 und mehr Einwohnern ins Leben zu rufen, welche die alljährliche Zahl der Gestorbenen, die Häufigkeit gewisser Ursachen der Sterbefälle, die Zahl der Lebend- und Totgeborenen und die Zahl der während des ersten Lebensjahres gestorbenen Kinder ersehen lässt. Die letzte Uebersicht über diese Bevölkerungsvorgänge für das Jahr 1910 ist in den Veröffentlichungen des Kaiserlichen Gesundheitsamts 1911, Seite 907, mitgeteilt.

Seit dem Jahre 1892 veröffentlicht das Kaiserliche Gesundheitsamt auch jährlich Ausweise über die Sterblichkeitsvorgänge der Bevölkerung in den einzelnen Verwaltungsbezirken der Bundesstaaten. Sie enthalten Angaben über das Geschlecht, und Lebensalter der Gestorbenen, wie auch über die wichtigsten Ursachen der Sterbefälle und werden unter der Bezeichnung "Todesursachenstatistik" in den Medizinalstatistischen Mitteilungen aus dem Kaiserlichen Gesundheitsamt alljährlich besprochen. Die letzten Ergebnisse für das Jahr 1909 sind im 15. Band dieser amtlichen Mitteilungen abgedruckt.

Ueber die Häufigkeit von Krankheiten welche die Bevölkerung des Deutschen Reichs heimsuchen, werden vor allen diejenigen zahlenmässig bekannt, welche in den Heilanstalten behandelt werden. Seit dem Jahre 1876 finden Erhebungen über die Morbidität und sonstigen Verhältnisse in den deutschen Heilanstalten, soweit diese mehr als 10 Krankenbetten zählen, statt. Die Ergebnisse dieser Heilanstaltsstatistik, die in der Regel drei aufeinanderfolgende Kalenderjahre umfassen, werden gleichfalls in den Medizinalstatistischen Mitteilungen des Kaiserlichen Gesundheitsamts veröffentlicht. Der letzte einschlägige Bericht (für die Jahre 1905, 1906, und 1907) findet sich in Band 17 der Medizinalstatistischen Mitteilungen.

Von statistischen Sondererhebungen auf gesundheitlichem Gebiet sind diejenigen über Blinde und Taubstumme zu erwähnen, die in Verbindung mit der allgemeinen Volkszählung vom 1. Dezember 1900 veranstaltet wurden. Neben dieser gelegentlich aufgestellten Taubstummenstatistik wird eine fortlaufende statistische Aufnahme der Taubstummen in der Weise veranstaltet, dass für jedes in das schulpflichtige Alter der vollsinnigen eingetretene oder einer Taubstummenanstalt überwiesene taubstumme Kind ein Fragebogen ausgefüllt wird, der als Material für die weitere statistische Bearbeitung dient. Die bisherigen Ergebnisse dieser Erhebungen für die Jahre 1902 bis 1905 sind im 12. Band der Medizinalstatistischen Mitteilungen enthalten.

Was die Medizinalgesetzgebung angeht, so war der erste Schritt, den das Reich unternahm, der Erlass des Impfgesetzes vom 8. April 1874.

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Den Anlass zu diesem Gesetz gab eine schwere Pockenepidemie, die in den Jahren 1871 und 1872 ganz Europa heimsuchte und allein in Deutschland mehr als 162,000 Menschen hinwegraffte. Dieser beklagenswerte Verlust an Menschenleben brachte es mit sich, dass in den einsichtsvollen Kreisen des Deutschen Volkes der Wunsch nach Einführung der obligatorischen Erst- und Wiederimpfung sich geltend machte. Insbesondere waren es der Verein für wissenschaftliche Heilkunde zu Königsberg i. P. und der Ausschuss des Vereins von 21 verschiedenen deutschen (meist Levensversicherungs-) Gesellschaften, die den Reichstag mit der Bitte wegen Erlass eines Impfgesetzes bestürmten. Unter dem Eindruck der überstandenen Pockengefahr ist dann auch das Impfgesetz mit seinen nunmehr seit beinahe vier Jahrzenten bewährten Bestimmungen zustande gekommen. Es schreibt vor, dass jedes Kind vor Ablauf des auf sein Geburtsjahr folgenden Kalenderjahres geimpft und in demjenigen Jahre, in welchem es das 12. Lebensjahr zurücklegt, wieder geimpft werden soll. Die Ausführung des Impfgesetzes liegt in den Händen der Einzelstaaten.

Um eine gleichmässige Handhabung dieser wichtigen Gesundheitsmassnahme sicher zu stellen, liess es sich die Reichsregierung von jeher angelegen sein, dass bei der Aufstellung der Vollzugsbestimmungen ihrer Mitwirkung nicht entraten würde. So wurde im Jahre 1884 vom Reichskanzler eine besondere Sachverständigen-Kommission einberufen, welche die Aufgabe hatte, den physiologischen und pathologischen Stand der Impffrage, insbesondere inbezug auf diejenigen Kautelen zu prüfen, die geeignet sind, die Impfung mit der grösstmöglichen Sicherheit zu umgeben. Die Beschlüsse dieser Kommission, die besonders die allgemeine Einführung der Impfung mit Tierlymphe empfahl, sind niedergelegt in den Beschlüssen des Bundesrats betr. das Impfwesen von 18. Juni 1885.[1] Da der Stand der Wissenschaft auf dem Gebiete des Impfwesens in erfreulicher Weise fortschritt, erschien es im Jahre 1899 abermals notwendig, eine Sachverständigen-Kommission einzuberufen, welche die Impffrage von neuem einer eingehenden Prüfung unterzog. Diese Kommission brachte eine Reihe von Verbesserungen der Vollzugsvorschriften in Vorschlag, die eine Erhöhung des Schutzes für den Impfling gegen schädliche-Nebenwirkungen der Impfung bezweckten, und das Impfgeschäft gewisser Unannehmlichkeiten für die Bevölkerung entkleiden sollten. Die von der Kommission gemachten Abänderungsvorschläge wurden vom Bundesrat in seiner Sitzung vom 23. Juni 1899 genehmigt.[2] Da diese Bundesratsbeschlüsse von den Deutschen Bundesregierungen als Muster für den Erlass von Ausführungsbestimmungen zu dem Impfgesetz benutzt wurden, so stimmen die einzelnen staatlichen Vorschriften meist wörtlich, immer

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aber in sachlicher Hinsicht überein. Ihr Inhalt sei hier kurz wiedergegeben. Sie enthalten:

Beschlüsse betreffend den physiologischen und pathologischen Stand der Impffrage. Hier sind in acht Sätzen die wissenschaftlichen Grundlagen festgelegt, auf denen die Forderung der obligatorischen Schutzpockenimpfung beruht. So wird z. B. hervorgehoben, dass die Dauer des durch die Impfung erzielten Schutzes gegen die Pocken innerhalb weiter Grenzen schwankt und im Durchschnitt 10 Jahre beträgt. Zur Erzielung eines ausreichenden Impfschutzes wird die Entwicklung von mindestens einer gut entwickelten Impfpocke für erforderlich erachtet. Hinsichtlich der sogenannten Impfschädigungen stehen die Beschlüsse auf dem Standpunkt, dass alle Gefahren durch sorgfältige Ausführung der Impfung auf einen so geringen Umfang beschränkt werden können, dass der Nutzen der Impfung den eventuellen Schaden derselben unendlich überwiegt.

In den Beschlüssen betreffend die allgemeine Einführung der Impfung mit Tierlymphe wird der Grundsatz aufgestellt, dass die Impfung nur mit animaler Lymphe vorzunehmen ist. Diese soll aus staatlichen Impfanstalten oder solchen Privatanstalten, die einer staatlichen Aufsicht unterstehen, bezogen werden. Ausserdem werden besondere Grundsätze für den Handel mit Tierlymphe in den Apotheken festgesetzt.

In dem Entwurf von Vorschriften, welche von den Aerzten bei der Ausführung des Impfgeschäftes zu befolgen sind, wird darauf hingewirkt, dass eine Verbreitung ansteckender Krankheiten durch die Ansammlung von Kindern bei den Impfterminen verhütet wird. Eine Untersuchung des Gesundheitszustandes der Impflinge wird dem Arzte zur Pflicht gemacht. Kinder, die an Krankheiten leiden, welche die Vornahme der Impfung bedenklich erscheinen lassen, sind zurückzustellen. Von grösster Wichtigkeit ist die Bestimmung, wonach die Impfung als chirurgische Operation anzusehen und mit voller Anwendung aller derjenigen Vorsichtsmassregeln auszuführen ist, welche geeignet sind, Wundinfektionskrankheiten fern zu halten; insbesondere hat der Impfarzt sorgfältig auf die Reinheit seiner Hände, der Impfinstrumente und der Impfstelle bedacht zu nehmen. Auch ist der Lymphevorrat während der Impfung durch Bedecken vor Verunreinigung zu schützen. Während in den Bundesratsbeschlüssen vom Jahre 1885 für erste Impfungen 3–5, für Wiederimpfungen 5–8 Impfschnitte oder oberflächliche Stiche vorgesehen waren, sind nach den Vorschriften vom Jahre 1899 4 seichte Schnitte von höchstens 1 cm Länge ausreichend. Die einzelnen Impfschnitte müssen mindestens 2 cm von einander entfernt sein. Zu den Ausführungsbestimmungen zu dem Impfgesetz gehören auch Verhaltungsvorschriften für die Angehörigen der Erstimpflinge und für die

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Wiederimpflinge. Die Vorschriften welche von den Behörden bei der Ausführung des Impfgeschäfts zu befolgen sind, verpflichten diese zur Verteilung dieser Verhaltungsvorschriften, Bereitstellung der Räume, Bestellung der entsprechenden Schreibhilfe und Vornahme von Ermittelungen bei wirklichen und angeblichen Impfschädigungen. Die Beschlüsse betreffend die Sicherung einer zweckmässigen Auswahl der Impfärzte ermöglichen der Staatsbehörde eine massgebende Mitwirkung bei der Anstellung und Besoldung der Impfärzte. Durch die Beschlüsse betreffend die technische Vorbildung der Aerzte für das Impfgeschäft wird erreicht, dass die Studierenden der Medizin sich die nötige theoretische und praktische Kenntnis über das Impfgeschäft und die Impftechnik aneignen. Schliesslich ist durch die Beschlüsse, betreffend die Anordnung einer ständigen technischen Ueberwachung des Impfgeschäftes durch Medizinalbeamte erzielt worden, dass die Impftermine von Zeit zu Zeit einer Revision durch einen Medizinalbeamten unterzogen werden.

Der Vollzug des Impfgesetzes und seiner Ausführungsvorschriften bedarf einer besonderen Ueberwachung seitens der Reichsverwaltung. Das Material hierfür liefern die statistischen Uebersichten der Erst- und Wiederimpfungen, die von den Impfärzten aufgestellt und von den einzelnen Staaten weiter verarbeitet werden. Diese Berichte gehen alljährlich dem Kaiserlichen Gesundheitsamt zu, das eine Statistik der Impfungen fortlaufend veröffentlicht. Aus diesen Jahresberichten ist vor allem zu entnehmen: die Zahl der Impfpflichtigen und der geimpften Kinder, ferner wie viele davon mit Erfolg, mit unbekanntem Erfolg geimpft wurden, wie viele Krankheitshalber zurückgestellt wurden, und wieviele sich vorschriftswidrig der Impfung entzogen haben. So blieben beispielsweise der Impfung in vorschriftswidriger Weise fern, in den 5 Jahren 1904–1908: a) von 100 Erstimpfpflichtigen 2.03, 2.07, 2.10, 2.14, 1.98; b) von 100 Widerimpfpflichtigen 0.41, 0.43, 0.42, 0.42, 0.38.

Die geringen Unterschiede in diesen Zahlen lassen bereits erkennen, dass das Impfgeschäft im Deutschen Reich mit grösster Regelmässigkeit und Gleichmässigkeit durchgeführt wird, und dass nur wenige Bewohner vorhanden sind, die sich der Impfpflicht nicht unterworfen haben. Neben diesem rein statistischen Material enthält der Impfbericht auch Besprechungen über die bei dem Impfgeschäft gemachten Erfahrungen und Bemerkungen. Diese besonderen Mitteilungen beziehen sich hauptsächlich auf die Impfräumlichkeiten, die Tätigkeit der Impfärzte, die Mitwirkungen der Polizeibehörde beim Impfgschäft, die wirklichen oder angeblichen Impfschädigungen sowie auf den Widerstand der etwa dem Impfgesetz seitens der Bevölkerung entgegengebracht wurde.[3]

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Zur Gewinnung des tierischen Impfstoffes sind zur Zeit im Deutschen Reich 20 staatliche Lymphe-Gewinnungsanstalten in Tätigkeit. Um den geordneten und einwandfreien Betrieb dieser Anstalten sicher zu stellen, hat der Bundesrat bereits in seiner Sitzung vom 28. April 1887 eine Anweisung zur Gewinnung, Aufbewahrung und Versendung von Tierlymphe beschlossen.[4] An ihre Stelle traten infolge des Bundesratsbeschlusses vom 28. Juni 1899 Vorschriften über Einrichtungen und Betrieb der staatlichen Anstalten zur Gewinnung der Tierlymphe.[5] Auch diese wurden durch die Fortschritte der Wissenschaft und durch neuere praktische Erfahrungen rasch überholt, so dass am 28. Juni 1911 abermals eine Neuregelung dieser Angelegenheit erfolgt ist.[6]

In diesen neuen Bundesratsbeschlüssen sind vor allem die Regeln der medizinischen Asepsis für die Herstellung, Aufbewahrung und Abgabe des Impfstoffs im weitgehendsten Masse verwertet. An die Zahl der Räume in einer Lymphgewinnungsanstalt wurden nicht unerhebliche Mehrforderungen gestellt. Die Vornahme einer Tuberkulinprobe bei den einzustellenden Tieren wird besonders empfohlen, und die Benutzung des Kaninchens als Zwischenwirt für die Vakzine zur Auffrischung des Impfstoffes zugelassen, Ausserdem wurde den Impfanstalten nahe gelegt, ihre Stammlymphe bei sich bietender Gelegenheit durch Animpfen von Tieren mit echtem Menschenpockenstoff aufzufrischen. Ferner ist es zulässig, die Wirksamkeit des gewonnenen Impfstoffes an Kaninchen zu erproben. Schliesslich wurden die Impfanstalten verpflichtet, einen eisernen Bestand von Impfstoff für den Fall des Ausbruchs einer Pockenepidemie vorrätig zu halten.

Ueber die Tätigkeit der Lymphe-Gewinnungsanstalten gehen dem Kaiserlichen Gesundheitsamt Berichte zu, aus denen alljährlich ein im Kaiserlichen Gesundheitsamt bearbeiteter Gesamtbericht nach einheitlichen Gesichtspunkten zusammengestellt wird.[7]

Um die Wirkung des Impfgesetzes kennen zu lernen, erschien es zunächst erwünscht, eine ausgedehnte erschöpfende Statistik über Pockensterblichkeit zu besitzen. Eine statistische Aufnahme der Pockentodesfälle auf Grund besonderer Zählkarten erfolgt im Deutschen Reich seitdem Jahre 1885.[8] Diese Erhebungen wurden im Jahre 1895 auch auf Pockenerkrankungen ausgedehnt. Die Ergebnisse dieser Statistik, die insbesondere den Impfzustand, die Staatsangehörigkeit der Kranken und Gestorbenen eingehend berücksichtigt, werden regelmässig in den Medizinal-Statistischen Mitteilungen des Kaiserlichen Gesundheitsamts mitgeteilt. Wie gering unter der Handhabung des Impfgesetzes die Pockengefahr im Deutschen Reiche geworden ist, geht aus nachstehenden Zahlen hervor. Bei einer Bevölkerung von nahezu 65,000,000 Einwohnern

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(Volkszählung am 1. Dezember 1910) erkrankten (starben) an Pocken in den 10 Jahren 1902–1911: 1902, 114, (15); 1903, 172, (20); 1904, 189, (25); 1905, 212, (30); 1906, 256, (47); 1907, 345, (63); 1908, 434, (65); 1909, 247, (26); 1910, 236, (34); 1911, 287, (37).

Unter diesen Pockenkranken und -Gestorbenen befinden sich alljährlich auffallend viel Ausländer, die naturgemäss nicht unter dem Schutze des Deutschen Impfgesetzes stehen. Im Jahre 1905 betrug der Anteil der Ausländer an der Gesamtzahl der Kranken sogar mehr als die Hälfte, 53 Prozent.[9]

Der Ausbruch der Cholera im Deutschen Reich gab im Jahre 1892 der Reichsverwaltung den Anlass im Einverständnis mit den hauptsächlich beteiligten Regierungen Massnahmen gegen Cholera auszuarbeiten.[10] Diese unter der Mitwirkung und nach den Ratschlägen von Robert Koch aufgestellten Massnahmen wurden im Jahre 1893 vervollständigt und erweitert.[11] Sie bildeten die Unterlage für das sieben Jahr später erlassene Reichsgesetz betreffend die Bekämpfung gemeingefährlicher Krankheiten vom 30. Juni 1900.[12] Es bezweckt der Hauptsache nach die Bekämpfung der sogenannten "Reichsseuchen" Aussatz, Cholera, Fleckfieber, Gelbfieber, Pest, und Pocken, während die Unterdrückung der sonstigen übertragbaren Krankheiten sich nach Landesrecht regelt.

Das Reichsseuchengesetz zerfällt in die Abschnitte: Anzeigepflicht, Ermittelung der Krankheit, Schutzmassregeln, Entschädigung, allgemeine Vorschriften, Strafvorschriften und Schlussbestimmungen.

Hinsichtlich der Anzeigepflicht ist bemerkenswert, dass nicht nur die festgestellten Erkrankungen der Behörde zu melden sind, sondern auch diejenigen Fälle, die nur den Verdacht einer gemeingefährlichen Krankheit erwecken. Anzeigepflichtige Personen sind in erster Linie die behandelnden Aerzte. Falls ein solcher nicht zugezogen ist, geht die Verpflichtung über auf den Haushaltungsvorstand, die sonst mit der Behandlung oder Pflege des Kranken beschäftigten Personen, den Inhaber der Wohnung oder den Leichenschauer. Um die Ausdehnung der Seuchen festzustellen, kann die obere Verwaltungsbehörde Ermittelungen über jeden einzelnen Krankheits- oder Todesfall anordnen, was bei der Wichtigkeit des Ausbruchs einer gemeingefährlichen Krankheit in der Regel geschieht. Zu diesem Zwecke ist dem beamteten Arzt der Zutritt zu dem Kranken und der Leiche zu gestatten. Auch kann bei Cholera-, Gelbfieber- und Pestverdächtigen eine Oeffnung der Leiche polizeilich angeordnet werden.

Des weiteren wird der Bundesrat in dem Gesetz ermächtigt, nähere Bestimmungen über die Anwendung und Ausführung der Schutzmassnahmen zu treffen, wobei jedoch unter Vermeidung von Einzelvorschriften nur das Höchstmass derjenigen Verkehrsbeschränkungen abgegrenzt wird, die gegenüber den beteiligten Personen angewendet werden dürfen. Gegenüber den Kranken und Krankheitsverdäch-

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tigen ist eine Absonderung zulässig. Diese Massnahme kann dadurch besonders wirksam gestaltet werden, dass der Kranke unter Umständen zwangsweise in ein Krankenhaus übergeführt wird. Personen, die mit einer kranken Person in Berührung gekommen sind, bei denen daher die Besorgnis vorliegt, dass sie den Ansteckungsstoff aufgenommen haben (Ansteckungsverdächtige), können einer Absonderung oder Beobachtung unterstellt werden. Diese Beobachtungen haben lediglich darin zu bestehen, dass über den Zustand der betreffenden Person zeitweise Erkundigungen eingezogen werden. Gegenüber obdachlosen Personen, die bekanntlich bei der Verbreitung von Seuchen eine nicht unerhebliche Rolle spielen, sind schärfere Massnahmen zulässig. Um die Bevölkerung vor dem Betreten verseuchter Räume zu warnen, können Wohnungen oder Häuser in denen erkrankte Personen sich befinden, durch eine Tafel kenntlich gemacht werden. In allen Fällen kann eine Desinfektion der hierfür in Betracht kommenden Gegenstände und Räume angeordnet werden. Für die Pestbekämpfung ist es von besonderer Wichtigkeit, dass verseuchte Wohnungen geräumt und eine Vernichtung von Ratten und Mäusen vorgeschrieben werden kann. Ferner ist es möglich, im Interesse der Cholerabekämpfung, die in der Flussschifffahrt beschäftigten Personen einer scharfen Beobachtung zu unterstellen sowie die Benutzung von Brunnen, Wasserleitung-, Schwimm-, Bade oder Waschanstalten und dergl. zu beschränken oder zu verbieten. Weitere Vorschriften beziehen sich auf die Verhütung von Menschenansammlungen bei Seuchenausbrüchen und auf die Vorsichtsmassregeln bei der Behandlung von Leichen. Ausserdem gibt das Reichsseuchengesetz eine Handhabe, um die Einschleppung von gemeingefährlichen Krankheiten in das Reichsgebiet zu verhindern. Es können "Quarantänevorschriften" erlassen, gesundheitliche Massnahmen im Eisenbahnverkehr ergriffen und ein Einfuhrverbot in Kraft gesetzt werden.

Eine wichtige Bestimmung liegt in der gesetzlichen Ermächtigung der Reichsverwaltung zur Bestellung eines Reichskommissars, falls zur Bekämpfung einer gemeingefährlichen Krankheit Massnahmen erforderlich sind, von denen die Gebiete mehrerer Bundesstaaten betroffen werden. Dieser hat für die Wahrung der nötigen Einheitlichkeit und Gleichmässigkeit der Massnahmen zu sorgen und besitzt die Vollmacht, das Erforderliche anzuordnen und nötigenfalls die Behörden der Bundesstaaten unmittelbar mit Weisungen zu versehen. Von dieser gesetzlichen Ermächtigung ist erstmalig im September des Jahres 1905 anlässlich des Auftretens der Cholera im Stromgebiet der Elbe Gebrauch gemacht worden. Es wurde damals von dem Reichskanzler ein Reichskommissar für die Ueberwachung des Schifffahrtsverkehrs in diesem Stromgebiet ernannt.

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Zu dem Reichs-Seuchengesetz sind Ausführungsbestimmungen des Bundesrats erschienen.[13] Die in dem Gesetz und den Ausführungsvorschriften enthaltenen Bestimmungen wurden zum leichteren Verständnis für die Vollzugsbehörden in Einzelanweisungen zur Bekämpfung der Pest, Cholera, Pocken, des Fleckfiebers, und des Aussatzes zusammengefasst; sie sind im Verlag von Julius Springer, Berlin W. 9, Linkstrasse 23–24 erschienen.

Bei der Aufstellung der in den Anweisungen vorgesehenen Abwehr- und Unterdrückungsmassnahme wurde von dem Grundsatz ausgegangen, der Eigentümlichkeit der einzelnen Krankheitskeime und ihrer Verbreitungsweise Rechnung zu tragen.

Dass der Kampf gegen die Cholera durch Ueberwachung der Wasserversorgungsanlagen, Reinhaltung der Wasserleitung und täglichen ärztlichen Besichtigung der in der Flussschiffahrt oder Flössereien beschäftigten Personen sowie der fremdländischen Durchwanderer geführt werden muss, geht aus der Anweisung zur Bekämpfung der Cholera vom 28. Januar 1904 klar hervor. Grosser Wert wird bei der Cholerabekämpfung auf die bakteriologische Untersuchung nicht nur der Kranken und Krankheitsverdächtigen, sondern auch der Personen aus der Umgebung der Kranken gelegt. Hinsichtlich der Bazillenträger ist vorgeschrieben, dass anscheinend gesunde Personen, in deren Ausleerungen bei der bakteriologischen Untersuchung Choleraerreger gefunden werden, wie Kranke zu behandeln sind.

Zur Bekämpfung des Aussatzes hat sich als beste und zweckmässigste Massregel die Unterbringung des Kranken in einem Krankenhause erwiesen. An der Ostgrenze des Deutschen Reichs bei Memel, wo sich ein vereinzelter Lepraherd befindet, ist ein Heim für Aussatzkranke errichtet, das trotz seiner geringen Grösse dem vorhandenen Bedürfnis entspricht. Nach der Anweisung zur Bekämpfung des Aussatzes können Leprakranke unter Umständen zwangsweise in dieses Lepraheim überführt werden.

Bei den Pocken würden alle Bemühungen, die Verbreitung der Seuche zu verhindern, in Deutschland fruchtlos bleiben, falls nicht die Schutzpockenimpfung zu Gebote stünde. Wenn auch auf Grund des Impfgesetzes vom 8. April 1874 der Impfschutz der Bevölkerung des Deutschen Reichs ein recht weitgehender ist, so bedarf es doch beim Ausbruch der Pocken ausserordentlicher Impfungen, um die Kinder der ersten Lebensmonate und diejenigen Personen gegen die Ansteckung zu schützen, bei denen die letzte Impfung eine Reihe von Jahren zurückliegt. Da das Reichsseuchengesetz eine Handhabe für solche Zwangsimpfungen beim Ausbruch einer Pockenepidemie nicht bietet, Aweist die Anweisung zur Bekämpfung der Pocken darauf hin, dass diese Massregel auf Grund landesrechtlicher Bestimmungen, die ja von früheren Pockenzeiten

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her noch in Kraft sind, zu vollziehen ist. Die Anweisung zur Bekämpfung des Fleckfiebers schliesst sich in ihren Vorschriften an die Anweisung zur Bekämpfung der Pocken an unter Wegfall der auf die Schutzimpfung sich beziehenden Hinweise.

Ausführungsvorschriften zur Bekämpfung des Gelbfiebers zu erlassen, erschien bisher nicht erforderlich, da seit Jahrzehnten eine Gefahr der Einschleppung des Gelbfiebers in das Reichsgebiet nicht in die Erscheinung getreten ist. Es war vielmehr ausreichend, die Massregeln zur Abwehr dieser Krankheit in die Vorschriften über die gesundheitliche Behandlung der Seeschiffe in den deutschen Häfen aufzunehmen. Diese sind unter dem 29. August 1907 gleichfalls als Ausführungsbestimmungen zu dem Reichsseuchengesetz erlassen worden,[14] und schliessen sich in ihrem sächlichen Inhalt an die Vereinbarungen der Internationalen Sanitäts-Uebereinkunft zu Paris vom 3. Dezember 1903 an.[15] Sie unterscheiden entsprechend der Konvention in bezug auf Pest und Cholera zwischen reinen, verdächtigen und verseuchten Schiffen, sowie Schiffen mit auffälliger Rattensterblichkeit und Rattenpestschiffen. Ausserdem enthalten sie Bestimmungen zur Verhütung der Einschleppung der Pocken, des Fleckfiebers, und des Aussatzes auf dem Seewege. Als besonders geeignet eine Einschleppung der Pest und anderer Seuchen in die deutschen Häfen zu verhindern, hat sich die Bestimmung erwiesen, auf Grund der alle Schiffe während der ganzen Dauer ihres Aufenthalts in den Häfen einer ständigen und allgemeinen gesundheitlichen Ueberwachung unterworfen werden. Auf Schiffen, die aus pestverseuchten Häfen eintreffen, wird diese Ueberwachung in der Weise gehandhabt, dass ein Gesundheitsaufseher während des ganzen Löschgeschäftes auf dem Schiffe sich aufhält und nach toten Ratten fahndet. Durch diese Vorsichtsmassregel ist es in zahlreichen Fällen gelungen, Rattenpest an Bord zu entdecken, die bei der allgemein üblichen Untersuchung nicht zu ermitteln gewesen wäre. So wurden in den letzten 12 Jahren allein im Hamburger Hafen 48 Schiffe mit Rattenpest—die Diagnose wurde durch die bakteriologische Untersuchung bei etwa 400 Ratten gestellt—und 2 Fälle von Pesterkrankung unter der Besatzung ausfindig gemacht.

Um diese Massnahmen zur Verhütung der Seucheneinschleppung im Verkehr mit dem Auslande in wirksamer Weise handhaben zu können, bedarf es einer genauen Kenntnis des Standes der Volksseuchen in Europa und in überseeischen Ländern. Nachrichten über die gesundheitlichen Verhältnisse im Auslande gehen durch die Kaiserlichen Konsulate regelmässig dem Auswärtigen Amt zu, das sie dem Kaiserlichen Gesundheitsamt mitteilt. Hier werden sie für die wöchentlich in den Veröffentlichungen des Kaiserlichen Gesundheitsamts bekanntgegebenen Mitteilungen über den Gesundheitzustand und den Gang der Volkskrankheiten verwertet. Auch enthalten

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sie die tatsächlichen Unterlagen, die diese Behörde bei Seuchengefahr in Stand setzen, Anträge wegen der ärztlichen Untersuchungen der Seeschiffe und wegen Erlasses eines Einfuhrverbotes zu stellen. Letzteres in Hinblick auf die Pest- oder Choleragefahr zu erlassen, ist der Reichskanzler gleichfalls auf Grund des Reichsseuchengesetzes hinsichlich der Einfuhr von Leibwäsche, alter und getragener Kleidungsstücke, gebrauchten Bettzeugs, Hadern und Lumpen ermächtigt.[16]

Mit einigen Nachbarstaaten sind ferner zur Durchführung eines schleunigen und sachgemässen Nachrichtendienstes besondere Abkommen getroffen worden, die eine unmittelbare gegenseitige Benachrichtigung der örtlichen Behörden diesseits und jenseits der Grenze bezwecken. Hieher gehoeren:

1) Bestimmungen betreffend Nachrichtenaustausch zwischen den deutschen und österreichischen Behörden in den Grenzbezirken über Cholerafälle und Choleramassmahmen, und die gegenseitige Einräumung der Befugnis zur Entsendung vom Kommissaren in die nahe der Grenze belegenen Choleraorte.[17]

2) Erlass des Königlich Preussischen Ministers der geistlichen p. p. Angelegenheiten betreffend Bestimmungen über Massregeln zur Bekämpfung der Cholera in den Deutschrussischen Grenzgebieten vom 22. August 1907.[18]

3) Abkommen zwischen der Kaiserlich Deutschen Regierung und der Königlich Belgischen Regierung über den Nachrichtenaustausch beim Auftreten ansteckender Krankheiten unter den Menschen in den deutsch-belgischen Grenzbezirken vom 7.–13. August 1907 [19] und 26.–29. Mai 1910.[20]

4) Abkommen zwischen der Kaiserlich Deutschen Regierung und der Grossherzoglich Luxemburgischen Regierung betreffend den Austausch von Nachrichten über das Auftreten von Typhus und Pocken vom 14. Dezember 1909.[21]

5) Abkommen zwischen der Kaiserlich deutschen Regierung und der Regierung der Französischen Republik, betreffend den Austausch von Nachrichten über das Auftreten von ansteckenden Menschen- und Tierkrankheiten in den beiderseitigen Grenzbezirken.[22]

6) Uebereinkunft zwischen dem Deutschen Reiche und Grossbritanien über die Bekämpfung der Schlafkrankheit in den beiderseitigen ostafrikanischen Gebieten vom 27. Oktober 1908 [23] desgleichen in dem Schutzgebiete Togo und in der Goldküstenkolonie, dem Aschanti-Protektorat und den nördlichen Gebieten der Goldküste vom 17. August 1911.[24]

Wenn das Gesetz betreffend die Bekämpfung gemeingefährlicher Krankheiten sich vornehmlich auf die Bekämpfung der in Deutschland nur selten vorkommenden Volksseuchen bezieht, so gewährt es doch einige Grundlagen, um auch gegenüber den sonstigen übertrag-

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baren Krankheiten vorzugehen, so kann nach § 5, Absatz 2, durch Beschluss des Bundesrats die Anzeigepflicht für sämtliche übertragbare Krankheiten für das ganze Reichsgebiet geregelt werden.

Nach § 27 können reichsgesetzliche Vorschriften erlassen werden über den Verkehr mit Krankheitserregern aller Art. Auf Grund dieser Bestimmungen hat der Bundesrat, nachdem unter dem 6. Oktober 1900 bereits Vorschriften über das Arbeiten und den Verkehr mit Pesterregern erlassen worden waren, Vorschriften über das Arbeiten und den Verkehr mit Krankheitserregern—ausgenommen Pesterregern—beschlossen, die unter dem 4. Mai 1904 bekannt gegeben sind.[35] Sie beziehen sich auf die Erreger der Cholera und des Rotzes, die sich nach dem Grad der Gefährlichkeit, unmittelbar den Erreger der Pest anschliessen sowie auf die sonstigen menschlichen Krankheitserreger und enthalten Bestimmungen bezüglich der Versendung von Material, welches lebende Krankheitserreger dieser Art enthält oder zu enthalten verdächtig erscheint. Dieses ist so zu verpacken, dass eine Verschleppung des Krankheitskeimes ausgeschlossen wird. Die Sendungen müssen fest verschlossen und mit deutlicher Adresse sowie mit dem Vermerk "Vorsicht" versehen sein. Um den praktischen Aerzten die Einsendung von Untersuchungsmaterial an die amtlichen bakteriologischen Untersuchungsanstalten zu erleichtern, ist durch das Reichspostamt zugestanden worden, dass bei besonders sorgfältiger doppelter Verpackung solche Stoffe auch in Briefform versandt werden können. Die hierbei benutzten gebrauchsfertigen Versandtgefässe werden in mehreren Bundesstaaten von den Apotheken unentgeltlich an die Aerzte abgegeben. Eine Zusammenfassung der einschlägigen Bestimmungen in Gestalt von Grundsätzen für den Post- und Eisenbahnversand von Körperteilen oder Stoffen sei es menschlicher, sei es tierischer Herkunft zu Lehr- oder Untersuchungszwecken wird zur Zeit vorbereitet.

Das Reichsseuchengesetz dient auch insofern zur Bekämpfung ansteckender Krankheiten überhaupt, als nach § 39, Absatz 3, der Bundesrat darüber Bestimmungen treffen kann, dass die Militär- und Polizeibehörden beim Auftreten übertragbarer Krankheiten sich gegenseitig in Kenntnis zu setzen haben. Diese Massregel ist insofern von grundsätzlicher Bedeutung als Seuchenausbrüche unter der Militärbevölkerung meist auf eine Ansteckung durch den Verkehr mit der Zivilbevölkerung zurückzuführen sind. Eine diesbezügliche Bekanntmachung ist zuletzt unter dem 28. Februar 1911 ergangen.[36]

Auch das Desinfektionswesen hat im Deutschen Reich nicht nur hinsichtlich der gemeingefährlichen Krankheiten eine einheitliche Gestaltung erfahren, sondern auch in Bezug auf sonstige übertragbare Krankheiten, indem der Bundesrat am 21. März 1907 eine allgemeine Desinfektionsanweisung beschlossen hat, die bezweckt,

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als Grundlage für den Erlass von besonderen Desinfektionsanweisungen für die einzelnen ansteckenden Krankheiten zu dienen, einerlei, ob ihre Bekämpfung reichsrechtlich oder landesrechtlich geregelt ist.[27]

Erwähnung verdient auch, dass die Postverwaltung und die Eisenbahnverwaltung, die selbständige Organisationen darstellen, eigene Vorschriften über die Bekämpfung gemeingefährlicher und anderer ansteckender Krankheiten erlassen haben, die jedoch in sachlicher Hinsicht mit den allgemeinen Vorschriften zur Unterdrückung von Seuchen übereinstimmen.[29] Auch die für das gesamte Reichsgebiet geltende Eisenbahnverkehrsordnung vom 23. Dezember 1908[30] enthält zahlreiche Bestimmungen, welche die Verhütung der Verbreitung von Infektionskrankheiten durch die Beförderung von Personen, Leichen oder tierischen Stoffen im Auge haben. Die Beförderung von Leichen auf der Eisenbahn ist ausserdem durch landesrechtliche Bestimmungen geregelt, die von den einzelnen Bundesregierungen nach einem vom Bundesrat unter dem 1. Dezember 1887 beschlossenen Entwurf erlassen worden sind.[31]

Unter dem 25. Januar 1906 erfolgte ferner eine Bekanntmachung des Bundesrats betreffend Vorschriften über die Beförderung von Leichen auf dem Seewege.[32]

In dem Gesetze, betreffend die Bekämpfung gemeingefährlicher Krankheiten vom 30. Juni 1900 hat auch die Wasserversorgung Berücksichtigung gefunden, insbesondere gibt die Bestimmung in §35 dieses Gesetzes den Behörden eine wertvolle Handhabe, um in allen Gemeinden des Reichs auf eine den hygienischen Anforderungen entsprechende Wasserversorgung hinwirken zu können. Damit sowohl die Errichtung neuer Wasserwerke als auch die vorgeschriebene Ueberwachung durch staatliche Beamte in einheitlicher Weise durchgeführt werden könnte, ist von Reichswegen eine Anleitung für die Einrichtung, den Betrieb und die Ueberwachung öffentlicher Wasserversorgungsanlagen welche nicht ausschliesslich technischen Zwecken dienen, im Jahre 1906[33] herausgegeben worden. Die ersten derartigen Grundsätze waren vom Kaiserlichen Gesundheitsamt im Jahre 1892 aus Anlass der Cholera in Hamburg aufgestellt worden.[34] Ferner sei hier auf die gutachtliche Tätigkeit des Kaiserlichen Gesundheitsamts auf dem Gebiete der Wasserversorgung, Abwässerbeseitigung und Flussverunreinigung hingewiesen sowie auf die bakteriologischen und biologischen Untersuchungen des Rheinlaufs, die seit 1904 in regelmässiger Wiederkehr von der Reichsregierung im Verein mit den beteiligten Bundesregierungen ausgeführt werden.

Bezüglich des Vorgehens der Reichsverwaltung gegenüber übertragbaren Krankheiten verdient die gemeinsame Typhusbekämpfung im Südwesten des Reichs besondere Erwähnung. Im preussischen Regierungsbezirk Trier, der bayrischen Pfalz, dem oldenburgischen

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Fürstentum Birkenfeld und dem reichsländischen Bezirk Unterelsass und Lothringen wurde im Jahre 1903 eine verstärkte Typhusbekämpfung ins Leben gerufen, bei der der von Robert Koch mit besonderem Nachdruck betonte Grundsatz leitend war, dass der Entstehungsort und zugleich der wichtigste Sitz und gefährlichste Verbreiter des Unterleibstyphus der infizierte Mensch sei. Um jeden einzelnen Typhusfall zu ermitteln, und um die Typhusherde ausfindig zu machen, wurden in diesem Gebiet 11 bakteriologische Untersuchungsanstalten eingerichtet, die im Jahre 1910, nachdem die Zahl der Erkrankungsfälle erheblich abgenommen hatte, auf 6 vermindert wurden. Ausserdem wurde zur Sicherung des einheitlichen Vorgehens und gleichmässigen Zusammenwirkens dieser Anstalten im Jahre 1904 ein besonderer Reichskommissar für die Typhusbekämpfung im Südwesten des Reichs bestellt, der die gesamte Bekämpfungsorganisation zu leiten hatte. Ueber die wissenschaftlichen Leistungen und die praktischen Erfolge dieser Typhusbekämpfung ist eine reichhaltige Literatur entstanden; ausserdem ist Ende des Jahres 1912 eine umfangreiche amtliche Denkschrift als 41. Band der Arbeiten aus dem Kaiserlichen Gesundheitsamt erschienen.

Die Tuberkulose-Bekämpfung gehört zur Zeit noch zur Competenz der einzelnen Bundesstaaten. Immerhin hat es sich die Reichsregierung angelegen sein lassen, auf diesem Gebiet der öffentlichen Wohlfahrt anregend und fördernd zu wirken und soweit möglich auch schöpferisch tätig zu sein. Sie hat an der Gründung des Deutschen Zentralkomitees zur Errichtung von Heilstätten für Lungenkranke (jetzt Zentral-Komitee zur Bekämpfung der Tuberkulose), dessen Vorsitz der Staatssekretär des Innern inne hat, sich lebhaft beteiligt. Dieses Zentralkomitee hat die Errichtung von Heilstätten für Lungenkranke nicht nur durch seinen Rat, sondern auch durch beträchtliche Zuschüsse gefördert, so dass die Zahl der zurzeit im Deutschen Reich vorhandenen derartigen Anstalten sich auf 99 beläuft. Ein solcher Erfolg war allerdings nur dadurch möglich, dass die Deutsche soziale Versicherungsgesetzgebung ihre reichen Geldmittel in den Dienst der Heilstättenbewegung stellte, und Hand in Hand mit der Organisation des Zentralkomitees arbeitete.

Die Voraussetzung für diese blühende Entwicklung der Heilstättenbewegung war der Nachweis eines dauernden Heilerfolges bei den in Lungenheilstätten behandelten tuberkulösen Personen. Um diesen Heilerfolg zu ermitteln, werden seit dem Jahre 1896 statistische Erhebungen auf Grund eines besonderen Zählkartenformulars veranstaltet. Nicht nur bei der Entlassung aus den Heilanstalten, sondern auch in jährlichen Zwischenräumen wird der Zustand der Heilstättenpfleglinge geprüft, und der Befund als Material einer umfangreichen Lungenheilstätten-Statistik verwertet.[35] Im übrigen wurde seitens der Reichsverwaltung den Einzelstaaten nahe gelegt,

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dahin zu wirken, dass auch nicht versicherte bedürftige Tuberkulöse der Heilstättenbehandlung teilhaftig wurden, ohne dass diese Fürsorge den Stempel der öffentlichen Armenfürsorge tragen würde. Während die Heilstättenbestrebungen sich in erster Linie den leicht Erkrankten und in einem frühen Krankheitsstadium sich befindenden Tuberkulösen zuwendete, wurde auch mehrfach auf die Notwendigkeit eines Krankenhausaufenthalts der an vorgeschrittener Lungen- oder Kehlkopftuberkulose leidenden Kranken hingewiesen. Zur Ermittelung der Häufigkeit des Lupus wurde am 1. November 1908 eine Umfrage bei den Aerzten veranstaltet, bei der 11,354 Lupuskranke festgestellt wurden.[36] Im übrigen sind aus Reichsmitteln für die Zwecke der Tuberkulosebekämpfung reiche finanzielle Beihilfen gewährt worden, die nicht nur, wie erwähnt, dem Zentralkomitee zuflossen, sondern auch dem Kaiserlichen Gesundheitsamt zur Ausführung wissenschaftlicher Arbeiten überwiesen worden sind.

Unter diesen sind vor allem die auf Anregung Robert Kochs unternommenen Nachprüfungen über die Beziehungen der Tuberkulose des Menschen zu derjenigen des Rindes hervorzuheben.[37]

Um die Ursache für die Entstehung der Milzbranderkrankung des Menschen, namentlich soweit dabei gewerbliche Beschädigungen in Betracht kommen, besser als bisher kennen zu lernen, und um die Häufigkeit solcher Krankheitsfälle festzustellen, wurde von seiten der Reichsverwaltung vom 1. Januar 1910 ab eine Statistik der Erkrankungen und Todesfälle an Milzbrand eingerichtet. (Vergl. Bekanntmachung des Reichskanzlers vom 28. September 1909.[38]) Die unter Verwendung eines besonderen Erhebungsformulars aufgemachte Statistik ergab, dass im Jahre 1910 im Deutschen Reiche 287 Fälle von Milzbrand vorgekommen sind, von denen 40, d. i. 4 Prozent einen tötlichen Ausgang genommen haben.[39] Ferner sei hier hingewiesen auf die Bekanntmachung des Reichskanzlers betreffend die Einrichtung und den Betrieb der Rosshaarspinnereien, Haar- und Borstenzurichtereien, sowie der Bürsten- und Pinselmachereien vom 22. Oktober 1902, in der bestimmte Desinfektionsvorschriften für Milzbrandverdächtiges Material vorgeschrieben sind.

Mit Bezug auf die auf den Menschen übertragbaren Tierkrankheiten—ausser Tuberkulose und Milzbrand kommen noch in Betracht Rotz, Tollwut, Maul- und Klauenseuche—sei erwähnt, dass die gesetzlichen Grundlagen der Bekämpfung der Viehseuchen gegeben sind durch das Viehseuchengestz vom 26. Juni 1909.

In das Gebiet der Reichsverwaltung fällt auch die gesundheitliche Fürsorge in bezug auf den Schiffsverkehr. Soweit dabei die Verhütung der Einschleppung ansteckender Krankheiten in Betracht kommt, sei auf die Ausführungen über die gesundheitliche Behandlung der Seeschiffe in den deutschen Häfen verwiesen.

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Um die gesundheitlichen Verhältnisse des Seemannsberufs, dessen Angehoerige ja bekanntlich mannigfacher Gefahr ausgesetzt sind, zu heben, hat die Reichsverwaltung dahin gewirkt, dass die Gesundheits- und Krankenpflege auf Kauffahrteischiffen als Lehrgegenstand auf den staatlichen Navigationsschulen aufgenommen wurde. Der Unterricht erfolgt hier durch Aerzte, denen die im Kaiserlichen Gesundheitsamt bearbeitete "Anleitung zur Gesundheitspflege auf Kauffahrteischiffen" an die Hand gegeben ist. Wegen der zahlreichen Unfälle und Verletzungen die bei der Bemannung der Fischdampfer und Heringslogger zu dauernden Störungen der Erwerbsfähigkeit führten, ist neuerdings auch auf Veranlassung des Staatssekretärs des Innern noch ein besonderer "Leitfaden für die erste Hilfe an Bord von Seefischereifahrzeugen" aufgestellt worden.

Für den gesundheitlichen Schutz der Seeleute ist in Deutschland die Seemannsordnung vom 2. Juli 1902 massgebend.[40] Sie enthält positive Bestimmungen über die Verköstigung und Arbeitszeit der Mannschaft und bildet die Grundlage für eine Reihe besonderer Ausführungsvorschriften. Als solche sind zu erwähnen: Die Bekanntmachungen betreffend die Untersuchung von Schiffsleuten auf die Tauglichkeit zum Schiffsdienst vom 1. Juli 1905,[41] die Bekanntmachung betreffend die Logis- Wasch- und Baderäume, sowie die Aborte für die Schiffsmannschaft auf Kauffahrteischiffen vom 2. Juli 1905[42] sowie die Bekanntmachung betreffend Krankenfürsorge auf Kauffahrteischiffen vom 3. Juli 1905.[43]

Die letztere Bekanntmachung führt in besonderen Verzeichnissen auf, was die Schiffe an Arzneien und Mitteln zur Krankenpflege mitzuführen haben, und welche Schiffe von einem Arzt zu besetzen sind, und erstreckt sich auch auf das Vorhandensein und die Einrichtung von Krankenräumen.

Während die Seemannsordnung und ihre Ausführungsbestimmungen im allgemeinen Fürsorge für den Seemann treffen, ist im Deutschen Reiche auch ein Gesetz vorhanden, das die Ernährung und Unterbringung der Auswanderer auf Schiffen, regelt. Die einschlägigen Vorschriften finden sich teils im Gesetz über das Auswandererwesen vom 9. Juni 1897. Für diese Schiffe hat ausserdem der Bundesrat laut Bekanntmachung vom 14. März 1898[44] Vorschriften erlassen, die sich auch mit den hygienischen Verhältnissen und der Krankenfürsorge an Bord befassen.

Durch reichsgesetzliche Massnahmen ist in Deutschland auch die Lebensmittelkontrolle einheitlich geregelt und zwar in erster Linie durch das Gesetz, betreffend den Verkehr mit Nahrungsmitteln, Genussmitteln und Gebrauchsgegenständen, vom 14. Mai 1879. Dieses Gesetz gewährt insbesondere den Polizeibeamten das Recht, Proben in den Geschäften und auf den Märkten zur Untersuchung

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zu entnehmen, und droht strenge Strafen denjenigen an, die Nahrungs- oder Genussmittel nachahmen oder verfälschen und die gesundheitsschädliche Nahrungs- oder Genussmittel herstellen oder im Verkehr bringen.

Da die allgemeinen Bestimmungen dieses Gesetzes nicht ausreichten, um allen Missständen im Verkehr mit Lebensmitteln und Gebrauchsgegenständen (Spielwaren, Tapeten, Farben, Ess-, Trink- und Kochgeschirr Petroleum, Bekleidungsgegenstände) zu begegnen, sind zur Ergänzung folgende Spezialgesetze ergangen:

1) Gesetz betreffend den Verkehr mit blei- und zinkhaltigen Gegenständen, vom 25. Juni 1887.

Durch dieses Gesetz ist die höchste zulässige Grenze des Bleigehalts von Ess- und Kochgeschirr sowie von Flüssigkeitsmassen, einschliesslich der innern Metallüberzüge (Verzinnungen u. s. w.) und Lötungsflächen dieser Gegenstände und der Konservenbüchsen, auf 10 Prozent festgesetzt worden; ähnliches gilt für die Geschirre und Gefässe zur Verfertigung von Getränken und Fruchtsäften. Strengere Bestimmungen gelten für Bierdruckvorrichtungen, für Siphons kohlensäurehaltiger Getränke, für Metallteile an Saugflaschen und für Metallfolien zur Verpackung von Käse, Schnupf- und Kautabak (Höchstgehalt 1 Prozent), ausserdem ist die Verwendung von bleihaltigem Kautschuck für Mundstücke an Saugflaschen und ähnlichem, für Spezialwaren und für Schläuche zu Bier-, Wein- und Essigleitungen verboten.

2) Gesetz betreffend die Verwendung gesundheitsschädlicher Farben bei der Herstellung von Nahrungsmitteln, Genussmitteln und Gebrauchsgegenständen, vom 5. Juli 1887.

Nach diesem Gesetz darf eine Anzahl einzeln aufgeführter Farbstoffe bei der Herstellung von Nahrungs- und Genussmitteln einschliesslich ihrer Aufbewahrung und Verpackungsbehälter, sowie von kosmetischen Mitteln und Spielwaren nicht oder nur in besonders angegebenen schwerlöslichen Verbindungen verwendet werden. Arsenhaltige Farben unterliegen weiteren Beschränkungen bei der Herstellung von Buch- und Steindruckfarben, Tapeten, Möbel- und Kleiderstoffen, Teppichen, Masken, Kerzen, künstlichen Blättern, Blumen und Früchten.

3) Gesetz betreffend den Verkehr mit Butter, Käse, Schmalz und deren Ersatzmitteln, vom 15. Juni 1897.

Dieses Gesetz schreibt eine jedermann kenntliche Bezeichnung und äussere Form der dem Scheine, aber nicht dem Wesen nach gleichartigen Konkurrenzerzeugnisse (Margarine, Margarinekäse, Kunstspeisefette) sowie den Zusatz eines in einfacher Weise nachzuprüfenden unschädlichen Stoffes (Sesamöl) und die gesonderte Herstellung, Aufbewahrung, Verpackung und Feilhaltung dieser Fabrikate von reiner Butter vor.

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Ausserdem wurde unter dem 1. März 1902 ein Mindestfettgehalt der Butter von 80 Prozent und ein höchster zulässiger Wassergehalt von 18 Prozent (bei gesalzener Butter 16 Prozent) festgesetzt.

Eine reichsgesetzliche Regelung des Milchverkehrs hat nicht stattgefunden, es sind jedoch unter Zugrundelegung der "Technischen Anhaltspunkte für die Handhabung der Milchkontrolle" [45] die im Jahr 1882 im Kaiserlichen Gesundheitsamt ausgearbeitet wurden, von den zuständigen Behörden der Einzelstaaten entsprechende gesundheitspolizeiliche Verordnungen zur Ueberwachung des Verkehrs mit Milch erlassen worden.

4) Gesetz betreffend die Schlachtvieh- und Fleischbeschau, vom 3. Juni 1900.

Durch dieses Gesetz sind die berechtigten Wünsche nach einer sachkundigen Untersuchung der Fleischnahrung erfüllt worden, und zwar in der Weise, dass im Innland eine Prüfung der lebenden Schlachttiere und des Fleisches nach der Schlachtung stattfindet, das vom Ausland kommende Fleisch aber wegen des Fortfalls der Lebenduntersuchung einer schärferen Kontrolle bei der Einfuhr unterliegt. Im Anschluss an das Gesetz sind vom Bundesrate laut Bekanntmachung des Reichskanzlers vom 18. Februar 1902 [46] und 4. Juli 1908 [47] eine Anzahl gesundheitsschädlicher chemischer Stoffe (Borsäure, Formaldehyd, schweflige Säure, unterschwefligsaure Salze, Fluorwasserstoff, Salizylsäure, chlorsaure Salze u. s. w.) als Zusatz zum verkäuflichen Fleische verboten. Die Ergebnisse der Schlachtvieh- und Fleischbeschau werden alljährlich nach näherer Anordnung des Bundesrats statistisch gesammelt, im Kaiserlichen Gesundheitsamt bearbeitet und zur Veröffentlichung gebracht.[48]

Wie erspriesslich eine geordnete Fleischbeschau wirkt, lässt sich z. B. erkennen aus der Abnahme der Trichinen und der gesundheitsschädlichen Finnen des Schweines.

5) Das Weingesetz vom 7. April 1909 verfolgt den Zweck, nicht nur den Zusatz schädlicher Stoffe, sondern auch den aus einer Streckung des Weins erwachsenden unlauteren Wettbewerb zu hindern und Kunsterzeugnisse überhaupt auszuschliessen.

6) das Süssstoffgesetz vom 7. Juli 1902, das den Verkehr mit Sacharin und dergl. regelt T.

7) Das Gesetz betreffend die Phosphorzündwaren vom 10. Mai, 1903, das die Verwendung von weissem oder gelbem Phosphor zur Herstelung von Zündhölzern verbietet.

Ausserdem ist für den Erlass ergänzender Vorschriften der Weg durch Kaiserliche Verordnung beschritten worden. Hierher gehört die Kaiserliche Verordnung betreffend das gewerbsmässige Verkaufen und Feilhalten von Petroleum vom 24. Februar 1882 und die Kaiserliche Verordnung betreffend das Verbot von Maschinen zur Herstellung künstlicher Kaffeebohnen vom 1. Februar 1891.

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Besondere gesetzliche Bestimmungen, durch welche die Verwendung von Konservierungsmitteln bei Nahrungs- und Genussmitteln an und für sich geregelt wäre, sind im Deutschen Reich nicht vorhanden. Bei Wein, Fleisch und Fetten sind indessen Vorschriften erlassen, welche den Zusatz von Konservierungsmitteln zu diesen Nahrungs- und Genussmitteln im besondern berühren.

Die Handhabung der Lebensmittelkontrolle liegt den Landesbehörden ob, insbesondere sind wichtige Stützpunkte dafür die "Anstalten zur technischen Untersuchung von Nahrungs- und Genussmitteln." Die im Kaiserlichen Gesundheitsamt gesammelten und bearbeiteten Jahresberichte dieser Anstalten erscheinen unter dem Titel "Uebersicht über die Jahresberichte der öffentlichen Anstalten zur technischen Untersuchung von Nahrungs- und Genussmitteln im Deutschen Reich" im Buchhandel. Die Zahl dieser Anstalten ist von 56 im Jahre 1902 auf 132 im Jahre 1908 gestiegen. Um dem sich geltend machenden Bedürfnis nach einheitlichen Untersuchungsverfahren nachzukommen, trat auf Anregung des Kaiserlichen Gesundheitsamtes im Jahre 1894 eine Kommission von deutschen Nahrungsmittelchemikern zusammen. Das Ergebnis ihrer Beratungen und Arbeiten sind die "Vereinbarung zur einheitlichen Untersuchung und Beurteilung von Nahrungs- und Genussmitteln sowie Gebrauchgegenständen für das Deutsche Reich." [50]

Für Wein, Butter, Margarine, Fleisch und Fleischwaren, sowie Zucker, sind besondere Untersuchungsverfahren durch entsprechende Bekanntmachungen des Bundesrats vorgeschrieben. Allmählich hat sich aber das Bedürfnis herausgestellt, bezüglich der Beurteilung und Untersuchung sämtlicher Lebensmittel im Wege der Verordnung nach einem einheitlichen Plan auszuarbeitende Vorschriften zu erlassen. Die hierzu erforderlichen literarischen und experimentellen Studien, die grösstenteils im Kaiserlichen Gesundheitsamt ausgeführt wurden, sind zum Teil in besonderen Veröffentlichungen niedergelegt, die unter dem Titel "Experimentelle und kritische Beiträge zur Neubearbeitung der Vereinbarungen zur einheitlichen Untersuchung und Beurteilung von Nahrungs- und Genussmitteln sowie Gebrauchsgegenständen für das Deutsche Reich" als Sonderbände aus den Arbeiten aus dem Kaiserlichen Gesundheitsamte im Verlag von Julius Springer, Berlin, fortlaufend erscheinen. Bis jetzt sind die Entwürfe zu Festsetzungen über Honig, über Essig und Essigessenz sowie über Speisefette und Speiseöle erschienen.

In den Auszügen aus gerichtlichen Entscheidungen betreffend den Verkehr mit Nahrungsmittel, Genussmitteln und Gebrauchsgegenständen (Beilage zu den Veröffentlichungen des Kaiserlichen Gesundheitsamtes) sind die wichtigsten Gerichtserkenntnisse, insbe-

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sondere auch die für die Auslegung der Reichsgesetze massgebenden Entscheidungen des Reichsgerichts abgedruckt.

Der Handel mit Heilmitteln ist, von Ausnahmen abgesehen, auf Apotheken beschränkt und hier nur unter Einhaltung bestimmter Sicherheitsvorschriften zulässig. Die Apotheker bedürfen nach § 28 der Gewerbeordnung[51] einer Approbation, die auf Grund eines Nachweises der Befähigung erteilt wird. Der Bundesrat erlässt die Vorschriften über den Nachweis der Befähigung (Prüfungsordnung für Apotheker vom 18. Mai 1904—Zentralblatt für das Deutsche Reich, S. 159). Eine Kaiserliche Verordnung vom 22. Oktober 1901 (ergänzt am 31. März 1911) bestimmt, welche Stoffe ausschliesslich in den Apotheken verkauft werden dürfen. Der Verkehr mit Giften unterliegt den gleichmässig in allen Bundesstaaten auf Grund von Vereinbarungen im Bundesrat erlassenen Vorschriften über den Handel mit Giften. In gleicher Weise ist auch die Abgabe stark wirkender Arzneimittel sowie die Ankündigung und der Verkauf von Geheimmitteln und ähnlichen Arzneimitteln geregelt, ferner das Arzneibuch für das Deutsche Reich und die Deutsche Arzneitaxe geschaffen worden.

Die Ausübung der Heilkunde ist im Deutschen Reiche zum grössten Teil reichsgesetzlich geregelt. Während nach der Gewerbeordnung jedermann sich mit der Heilung kranker Personen befassen darf, ist die Bezeichnung "Arzt" geschützt für diejenigen, die auf Grund des Nachweises ihrer Befähigung eine staatliche Approbation erlangt haben. Auch ist die Ausübung der Heilkunde in gewissen Fällen (z. B. im Umherziehen, bei amtlichen Funktionen, Impfungen) nur den zur Führung des Titels "Arzt" Berechtigten vorbehalten. Zur Erlangung der Approbation als Arzt bedarf es nach den Bestimmungen des Bundesrats, betreffend die Prüfungsordnung für Aerzte vom 28. Mai 1901[52] der Ablegung der ärztlichen Vorprüfung, der ärztlichen Prüfung und der Ableistung des praktischen Jahres. Die gleichmässige Handhabung der Prüfungsordnungen wird dadurch sicher gestellt, dass dem Kaiserlichen Gesundheitsamt die Prüfungsakten zugängig gemacht werden, und von diesem eine Kontrolle darüber ausgeübt wird, ob die vorgeschriebenen Bestimmungen seitens der Prüfungskommissionen innegehalten werden. Die Prüfung der beamteten Aerzte ist landesrechtlich geregelt.

Auf die Prüfung der Zahnärzte bezieht sich die Bekanntmachung vom 15. März 1909.[53] Auch bei den Zahnärzten hat der eigentlichen Prüfung eine Vorprüfung voranzugehen.

Die Prüfung der Krankenpflegepersonen sowie ihre Ausbildung ist zwar nicht reichsgesetzlich geregelt, wohl aber ist hier auf dem Weg der Vereinbarung zwischen den Bundesregierungen eine Gleichmässigkeit und Einheitlichkeit erzielt worden. Am 22. März 1906

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hat der Bundesrat einen Entwurf von Vorschriften über die staatliche Prüfung von Krankepflegepersonen und einen Plan für ihre Ausbildung festgestellt.[54] Diese vereinbarten einheitlichen Vorschriften traten in den Bundesstaaten auf Grund besonderer Entschliessung der Landesregierungen in Form landesrechtlicher Bestimmung in Wirksamkeit.

Hinsichtlich der Hebammen ist für die Ausbildung und die Erteilung des Prüfungszeugnisses das Landesrecht massgebend. Es ist aber in Aussicht genommen, auch hier auf dem Wege der freiwilligen Vereinbarung im Bundesrat eine Gleichmässigkeit herbeizuführen.

Amtliche Erhebungen über die Verbreitung des Heilpersonals im Deutschen Reiche haben zuletzt am 1. Mai 1909 stattgefunden. Nach dem vom Kaiserlichen Gesundheitsamt bearbeiteten und veröffentlichten Ergebnis gab es damals insgesamt 30,558 Ärzte, 2,667 Zahnärzte, 7,214 Zahntechniker, 14,789 berufsmässige Heildiener, einschliesslich der Masseure und Desinfektoren, 29,577 berufsmässige Krankenpfleger, 4,468 Kurpfuscher, 37,736 Hebammen und 5,051 Tierärzte.[55]

Besonders umfangreich sind die Bestimmungen zum Schutze der Arbeiter.

Gewerbeaufsichtsbeamte sind jederzeit zur Revision der Gewerbebetriebe befugt (§139b der Gewerbeordnung).

Die Sonntagsruhe ist geregelt. Die Gewerbetreibenden können die Arbeiter zur Arbeit an Sonn- und Festtagen nicht verpflichten. In einigen Betrieben darf an Sonn- und Festtagen überhaupt nicht, in anderen Betrieben nur bis zu einer bestimmten Stundenzahl gearbeitet werden (§§105a–105g der Gewerbeordnung).

Die Gewerbeunternehmer sind verpflichtet, die Arbeitsräume, Betriebsvorrichtungen, Maschinen und Gerätschaften so einzurichten, dass die Arbeiter gegen Gefahren für Leben und Gesundheit soweit geschützt sind, wie es die Natur des Betriebes gestattet (§120a der Gewerbeordnung).

Für Kinder und jugendliche Arbeiterinnen sind besondere Schutzbestimmungen erlassen worden. Kinder unter 13 Jahren dürfen in Fabriken überhaupt nicht beschäftigt werden, Kinder über 13 Jahren nur dann, wenn sie nicht mehr zum Besuche der Volksschule verpflichtet sind. Die Beschäftigung von Kindern unter 14 Jahren darf die Dauer von 6 Stunden täglich nicht überschreiten. Junge Leute zwischen 14 und 16 Jahren dürfen in Fabriken nicht länger als 10 Stunden täglich beschäftigt werden. Arbeiterinnen dürfen in Fabriken Nachts und 4 Wochen nach ihrer Niederkunft überhaupt nicht, im übrigen nicht länger als 11 Stunden täglich beschäftigt werden (§§ 135–137 der Gewerbeordnung). Den Fabriken sind andere Betriebe gleich gestellt worden (§ 154, Absatz 2, 3, und 4 der Gewerbeordnung, sowie der Kaiserlichen Verordnungen vom 31. Mai 1897,

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17. Februar 1904 und 21. Februar 1907, Reichsgesesetzblatt 1897, S. 45a, 1904, s. 62, und 1907, S. 65). Das Gesetz betreffend Kinderarbeit in gewerblichen Betrieben, vom 30. März 1903, enthält bezüglich Kindern bis zu 13 Jahren (bezw. bis zur Beendigung der Volksschulpflicht) teils ein Verbot der Beschäftigung auch ausserhalb Fabriken, teils eine Beschränkung der Arbeitszeit.

Für Arbeiterinnen und jugendliche Arbeiter in besonders gesundheitsgefährlichen Betrieben sind auf Grund von §§ 120a und 139a, Absatz I, der Gewerbeordnung noch besondere Vorschriften (Untersagung bzw. Regelung der Beschäftigung) seitens des Bundesrats ergangen: Bezüglich Anlagen zur Herstellung elektrischer Akkumulatoren aus Blei oder Bleiverbindungen (Bekanntmachung des Reichskanzlers vom. 6. Mai 1908, Reichsgesetzblatt, Seite 172), gewerblichen Anlagen, in denen Thomasschlacke gemahlen oder Thomasschlackenmehl gelagert wird (desgl. vom 3. Juli und 17. Dezember 1909, R. G. Bl., S. 543 und 978), Zinkhütten (6. Februar 1900, 8. Dezember 1909 und 25. November 1910, R. G. Bl., 1900, S. 32, 1909 S. 971, und 1910, 1105), Werkstätten mit Motorbetrieb (13. Juli 1900 und 27. Februar 1907, R. G. Bl., 1900, S. 566, und 1907, S. 66), Zichorienfabriken (25. November 1909, R. G. Bl., S. 965), Anlagen zur Vulkanisierung von Gummiwaren (1. März 1909, R. G. Bl., S. 59), Glashütten, Glasschleifereien und Glasbeizereien sowie Sandbläsereien (5. März 1902, R. G. Bl., S. 65), Rohrzuckerfabriken, Zuckerraffinerien und Melasseentzuckerungsanstalten 5. März 1902, R. G. Bl., S. 72), Steinbrüchen und Steinhauereien (31. Mai und 8. Dezember 1909, sowie 20. November 1911, R. G. Bl., S. 471 und 971, 1911, S. 955), Walz- und Hammerwerken (27. Mai 1902 und 6. Juli 1906, R. G. Bl., 1902, S. 170, und 1906, S. 853), Anlagen zur Herstellung von Präservativs, Sicherheitspessarien, Suspensorien und dergleichen (30. Januar und 1. April 1903, R. G. Bl., S. 3 u. 123), Anlagen zur Herstellung von Bleifarben und anderen Bleiprodukten (26. Mai 1903, R. G. Bl., S. 225), Ziegeleien (15. November 1903, R. G. Bl., S. 286), Bleihütten, (16. Juni 1905, R. G. Bl., S. 545), Anlagen zur Anfertigung von Zigarren (17. Februar 1907, R. G. Bl., S. 34), Anlagen zur Herstellung von Alkali-Chromaten (16. Mai 1907, R. G. Bl., S. 233). Ferner ist vom Bundesrat geregelt worden, in welcher Weise beschäftigt werden dürfen: Arbeiterinnen unter 16 Jahren in Meiereien (Molkereien) und Betrieben zur Sterilisierung von Milch (4. Juni 1910, R. G. Bl., S. 868), in Betrieben zur Herstellung von Fischkonserven (25. November 1909, R. G. Bl., S. 965), jugendliche Arbeiter bei der Bearbeitung von Faserstoffen, Tierhaaren, Abfällen oder Lumpen (8. Dezember 1909, R. G. Bl., S. 969), auf Steinkohlenbergwerken (24. März 1903, R. G. Bl., S. 61), Lehrlinge unter 16 Jahren in Getreidemühlen (26. April 1899, R. G. Bl., S. 273).

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Auch für erwachsene Arbeiter ist die Arbeitzeit geregelt worden:
in Bäckereien und Konditoreien (4. März 1896, R. G. Bl., S. 55),
Getreidemühlen (26. April 1899, R. G. Bl., S. 273), Gast- und Schank-
wirtschaften (2. Januar 1902, R. G. Bl., S. 32), Anlagen zur Herstel-
lung elektrischer Akkumulatoren aus Blei oder Bleiverbindungen
(6. Mai 1908, R. G. Bl., S. 172), Anlagen, in denen Thomasschlacke
gemahlen wird u. s. w. (3. Juli und 17. Dezember 1909, R. G. Bl., S.
543 und 978), A nlagen zur Vulkanisierung von Gummiwaren (1.
März 1902, R. G. Bl., S. 59), Steinbrüchen (31. Mai und 8. Dezember
1909, R. G. Bl., S. 47 u. 97), und Anlagen zur Herstellung von Blei-
farben u. s. w. (26. März 1903, R. G. Bl., S. 225).

Wegen G dung denen Arbeiter Bleivergiftung ist ein aus
gedehnter geschaffen wo Anlagen zur Herstellun
elektrisch mulatoren gal au w. (6. Mai 1908, R. G. B
S. 172), I n (16. Juni hnte G. Bl., S. 545), Betrieben,
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beiten a werden (27. J pfuse G. Bl., S. 555), Buc
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Dezember 1911. dürfen in
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Notlagen durch ein
ge beruhende
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Handlungsgehilfen, Bühnen- und Orchestermitglieder, Privatlehrer, Schiffsoffiziere u. s. w. für den Fall der Berufsunfähigkeit und des Alters sowie zu Gunsten der Hinterbliebenen versichert (Versicherungsgesetz für Angestellte vom 20. Dezember 1911).

Für Seeleute sind auf Grund der Seemannsordnung vom 2. Juni 1902 vom Bundesrat Vorschriften über Tauglichkeit zum Dienst an Bord, über Einrichtung der Wohnräume, der Bade- und Waschräume und der Aborte sowie über die Krankenfürsorge erlassen worden. (Bekanntmachung des Reichskanzlers vom 1. Juli 1905, R. G. Bl., S. 561).

Zu den hygienischen Massnahmen, welche die Reichregierung getroffen hat, sind auch die Aufwendungen für Verbesserung der Wohnungsverhältnisse der Arbeiter und gering besoldeten Beamten zu rechnen. Zu diesem Zwecke sind im Reichetat im Laufe der Jahre 45 Millionen Mark ausgeworfen worden.

Schliesslich sei mir gestattet, auch noch einer vom Reiche durch das Kaiserliche Gesundheitsamt ausgehenden Tätigkeit belehrender Art für die grosse Masse der Bevölkerung zu gedenken. Das Kaiserliche Gesundheitsamt wirkt nicht nur gutachtend und helfend an der Vorbereitung der Gesetzgebung und der Verwaltungserlasse mit, es hat vielmehr von jeher seine Aufgabe auch so aufgefasst, dass ihm die praktische Verwertung wissenschaftlicher Lehren auf dem Gebiete der Hygiene zukommt. In diesem Sinne erschien es besonders dazu berufen, aus dem Gesamtbereich der Gesundheitswissenschaft dasjenige auszuwählen, und für die Oeffentlichkeit gemeinfasslich wiederzugeben, was überall bekannt sein sollte. Diesen Erwägungen verdankt das Gesundheitsbüchlein (Verlag von Julius Springer, Berlin) seine Entstehung, das bereits in der 15. Ausgabe vorliegt und auch in französischer, englischer, russischer, italienischer und spanischer Uebersetzung erschienen ist.

Zahlreiche gemeinverständliche Merkblätter legen Zeugnis ab, wie das Gesundheitsamt der Aufgabe gerecht zu werden sucht, die Lehren der Gesundheitspflege in Haus und Familie, in Schule und Werkstatt zu tragen und als hygienischer Erzieher durch planmässige Aufklärung auf die Massen zu wirken. Bisher sind im Verlag von Julius Springer, Berlin, folgende Merkblätter erschienen: Das Tuberkulose-, Diphtherie-, Ruhr-, Typhus-, Cholera-, Alkohol-, Pilz-Merkblatt, das Bleimerkblatt für Maler, Anstreicher, Tüncher, Weissbinder und Lackierer, das Schleifermerkblatt für Metallschleifer, das Merkblatt für Feilenhauer, das Merkblatt für Arbeiter in Chromgerbereibetrieben, ferner das Bandwurm- und Trichinen-, das Haustier-Schmarotzer-, das Dasselfliegen-Merkblatt, das Merkblatt über das ansteckende Verkalben der Kühe, sowie das Milch-Merkblatt erschienen.

Die Schilderung der zentralen Organisation des Gesundheitswesens im Deutschen Reich würde unvollständig sein, wenn nicht des

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Wirkens der grossen Organisationen gedacht würde, welche, sei es die öffentliche, sei es die persönliche Gesundheitspflege zu ihrem Arbeitsfeld gemacht haben. An ihrer Spitze steht der Deutsche Verein für öffentliche Gesundheitspflege, der seit mehr als 3 Jahrzehnten in seinen Wanderversammlungen bemüht ist, Behörden und Private auf die wichtigsten Fragen der Gesundheitspflege hinzuweisen, und ganz wesentliche Erfolge zu verzeichnen hat. Die altehrwürdige Versammlung der deutschen Naturforscher und Aerzte fördert die Hygiene in einer besonderen Gruppe, von der weithinreichende Anregungen ausgegangen sind. Der Deutsche Verein für Volkshygiene sucht die persönliche Gesundheitspflege in ihren verschiedenen Aesserungen zu heben. Auch das Deutsche Rote Kreuz hat als Friedenstätigkeit hygienische Bestrebungen in sein Programm aufgenommen. In ähnlichem Sinne sind folgende Vereine tätig: Der Vaterländische Frauenverein, der Deutsche Verein für Schulgesundheitspflege, das Deutsche Zentralkomitee für Zahnpflege in den Schulen, die Deutsche Gesellschaft zur Bekämpfung des Kurfuschertums, die Deutsche Gesellschaft für Volksbäder, das Deutsche Zentralkomitee für Krebsforschung, die Deutsche Gesellschaft zur Bekämpfung der Geschlechtskrankheiten, der Deutsche Verein gegen Missbrauch geistiger Getränke, das schon wiederholt erwähnte Deutsche Zentralkomitee zur Bekämpfung der Tuberkulose, das eine besondere Lupuskommission gebildet hat, das Zentralkomitee für Rettungswesen in Preussen, die Zentralstelle für Rettungswesen an Binnen- und Küstengewässern, die Deutsche Vereinigung für Säuglingsschutz, der Zentralausschuss für Volks- und Jugendspiele, die Deutsche Zentrale für Jugendfürsorge, die Deutsche Gesellschaft für Rassenhygiene, die freie Vereinigung Deutscher Nahrungsmittelchemiker, und andere Körperschaften, deren Arbeitsgebiet sich von demjenigen der sozialen Fürsorge nicht scharf abgrenzen lässt.

Nicht näher eingegangen in meinem Vortrage bin ich auf das grosse Werk der sozialen Versicher ungsgesetzgebung, das in einschneidender Weise auf die Verbesserung der gesundheitlichen Verhältnisse des Deutschen Volkes Einfluss hat und das Gesamtgebiet des Deutschen Reichs umfasst. Ueber dieses Thema wird ein besonderer Vortrag in Sektion IX des gegenwärtigen Kongresses von Herrn Ministerialrat Dr. Zahn aus München gehalten werden. Ich will nur kurz erwähnen, dass die bisherigen Einzelgesetze des Reichs für soziale Versicherung (Krankenversicherung, Unfallversicherung, Alters- und Invaliditätsversicherung) neuerdings ihre Codifikation in einem einheitlichen nicht weniger als 185 Paragraphen umfassenden Gesetze—der Reichsversicherungsordnung vom 19. Juli 1911—gefunden haben.

Für denjenigen, der sich genauer über die Tätigkeit der Reichsgewalt in Deutschland auf gesundheitlichem Gebiet unterrichten will,

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sei mir gestattet zu verweisen auf die Festschrift, welche das Kaiserliche Gesundheitsamt und das Kaiserliche Statistische Amt zum XIV. Internationalen Kongress für Hygiene und Demographie in Berlin 1907 unter dem Titel "Das Deutsche Reich in gesundheitlicher und demographischer Beziehung" (Verlag von Puttkamer & Mühlbrecht, Berlin 1907) herausgegeben haben, ferner auf die Festschrift, "Das Reichsversicherungsamt und die Deutsche Arbeiterversicherung," welche das Reichsversicherungsamt zum Jubiläum der Deutschen Unfall- und Invalidenversicherung im Jahre 1910 (Verlag von Behrend & Co., Berlin) hat erscheinen lassen.

Zu einer grossartigen Heerschau über Deutsches Gesundheitswesen deren Zustandekommen der Anregung und Initiative des Wirklichen Geheimen Rats Exzellenz Dr. Lingner in Dresden zu danken ist, haben im vorigen Jahre aus Anlass der Internationalen Hygiene-Ausstellung in der Haupt- und Residenzstadt des Königreichs Sachsen die staatlichen, städtischen und privaten Kreise, denen die Gesundheitspflege im Deutschen Reich am Herzen liegt, sich zusammengefunden. Hier war die beste Gelegenheit geboten, sich von dem derzeitigen Stande der Gesundheitspflege im Deutschen Reich ein anschauliches Bild zu verschaffen.

Mit besonderer Freude wird es von jedermann begrüsst werden, dass diese seinerzeit so vielbewunderte Darbietung auf dem Gebiet der Gesundheitspflege festgehalten werden wird in Gestalt eines bereits in Angriff genommenen Ausstellungswerkes, dass sie weiterleben soll in Gestalt des in Vorbereitung begriffenen grossen Hygiene-Museums in Dresden, einer segensreichen Einrichtung einzig in ihrer Art, über die Deutschland demnächst verfügen wird.

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[1] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1885, II, S. 46.

[2] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1899, S. 948.

[3] Der zuletzt erschienene Impfbericht bezieht sich auf das Jahr 1909 und ist in dem 16. Band der Medizinal-Statistischen Mitteilungen aus dem Kaiserlichen Gesundheitsamt veröffentlicht.

[4] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1887, S. 303.

[5] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1899, S. 948.

[6] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1911, S. 827.

[7] Der neueste derartige Jahresbericht (für das Jahr 1911) ist im 16. Bande der Medizinal-Statistischen Mitteilungen aus dem Kaiserlichen Gesundheitsamt abgedruckt.

[8] Veröffentlichungen des Kaiserlichen Gesundheitsamtes, 1885, II, S. 48 u. S. 173.

[9] Ein zusammenfassender Bericht über die Statistik der Pockentodesfälle im Deutschen Reich während des Vierteljahrhunderts 1886–1910 findet sich in Band 16 der Medizinal-Statistischen Mitteilungen aus dem Kaiserlichen Gesundheitsamt.

[10] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1892, S. 607.

[11] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1893, S. 841.

[12] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1900, S. 673.

[13] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1904, S. 226.

[14] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1907, S. 1033.

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[15] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1907, S. 993.

Die Sanitätskonvention vom 3. Dezember 1903 ist in den Beratungen der vom 7. November 1911 bis 17. Januar 1912 in Paris stattgehabten Sanitätskonferenz einer Revision unterzogen worden, die alte Konvention bleibt jedoch bis zur Ratificeirung der neuen, die noch nicht erfolgt ist, in Wirksamkeit.

[16] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1900, S. 702.

[17] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1897, S. 977.

[18] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1907, S. 1140.

[19] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1908, S. 68.

[20] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1910, S. 742.

[21] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1910, S. 208.

[22] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1911, S. 1254.

[23] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1908, S. 1285.

[24] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1911, S. 1046.

[25] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1904, S. 558.

[26] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1911, S. 336.

[27] Veröffentlichungen des Kaiserlichen Gesundheitsamtes, 1907, S. 863.

[28] Veröffentlichungen des Kaiserlichen Gesundheitsamtes, 1908, S. 1125, und 1910, S. 627.

[30] Veröffentlichungen des Kaiserlichen Gesundheitsamtes, 1909, S. 598.

[31] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1887, S. 746.

[32] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1906, S. 262.

[33] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1906, S. 777.

[34] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1892, S. 767.

[35] Die letzten einschlägigen Berichte finden sich im 13. Heft der Tuberkulose-Arbeiten aus dem Kaiserlichen Gesundheitsamt.

[36] Medizinal-statistische Mitteilungen, Band 13, S. 133.

[37] Die Ergebnisse dieser experimentellen Untersuchungen sind niedergelegt in den Tuberkulosearbeiten aus dem Kaiserlichen Gesundheitsamt, Heft 1, 3, 6, 7, 9, 10, 11, und 12.

[38] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1909, S. 1256.

[39] Medizinal-statistische Mitteilungen, Band 14, S. 205.

[40] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1902, S. 992.

[41] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1905, S. 795.

[42] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1905, S. 863.

[43] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1905, S. 865.

[44] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1898, S. 306.

[45] Arbeiten aus dem Kaiserlichen Gesundheitsamt, Bd. 1, S. 24.

[46] Veröffentlichungen aus dem Kaiserlichen Gesundheitsamt, 1902, S. 184.

[47] Veröffentlichungen aus dem Kaiserlichen Gesundheitsamt, 1908, S. 843.

[48] Bisher sind erschienen im Buchhandel (Julius Springer, Berlin) die Ergebnisse für die Jahre 1904–1909.

[49] Veröffentlichungen des Kaiserlichen Gesundheitsamtes 1902, S. 780.

[50] Verlag von Julius Springer, Berlin.

[51] Letzte Neuredaktion im Reichsgesetzblatt, 1900, S. 871.

[52] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1901, S. 537.

[53] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1909, S. 529.

[54] Veröffentlichungen des Kaiserlichen Gesundheitsamts, 1906, S. 492.

[55] Medizinalstatistische Mitteilungen aus dem Kaiserlichen Gesundheitsamt, Bd. 15.

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DIE VERWALTUNG DES ÖFFENTLICHEN GESUNDHEITSWESENS IN PREUSSEN.

Dr. SCHNEIDER, Regierungs- und Medicinalrat in Arnsberg.

Der grösste deutsche Bundesstaat, das Königreich Preussen, mit seinen 40 Millionen Einwohnern hat kein umfassendes Gesundheitsgesetz wie andere ausserdeutsche Staaten, sondern die Vorschriften, die sich auf die öffentliche Gesundheitspflege beziehn, sind in einer grossen Anzahl von Einzelgesetzen, königlichen Verordnungen, Ministerialerlassen, Polizeiverordnungen und Anweisungen der verschiedenen Behörden zerstreut.

Welcher Art aber auch immer diese Vorschriften sein mögen, ausgeführt werden sie von denselben Behörden, welche die innere Verwaltung in Preussen zu besorgen haben. Auch die Reichsgesundheitsgesetze, von denen der Herr Vorredner sprach, werden von diesen Behörden durchgeführt.

Wie ich für diejenigen, welchen die innere Verwaltung in Preussen nicht näher bekannt ist, bemerken möchte, unterscheiden wir in Preussen staatliche und kommunale Verwaltungsbehörden. Der preussische Staat gliedert sich in Provinzen; diese werden in Regierungsbezirke eingeteilt, die Regierungsbezirke in Kreise, die Kreise in Gemeinden.

Als staatliche Verwaltungsbehörden haben wir die Minister als Zentralinstanz für den ganzen Staat, die Oberpräsidenten für die 12 Provinzen, die Regierungspräsidenten für die 37 Regierungsbezirke, die Landräte für die 487 Landkreise. Die Kommunalen- oder Selbstverwaltungsbehörden sind die Verwaltungen der Provinzialverbände, der Kreisverbände, der Gemeinden.

Der Staat übt auf dem Gebiete des öffentlichen Gesundheitswesens vor allem eine Aufsicht aus, die Kommunalverwaltungen haben vorwiegend für die erforderlichen Einrichtungen zu sorgen. Zum Beispiel ist die Fürsorge für das Hebammenwesen, das Irren-, Taubstummen- und Idiotenwesen den Provinzialverwaltungen gesetzlich übertragen, die Impfungskosten und die Unterstützung der Hebammenbezirke ist Sache der Kreisverwaltungen, und die Gemeinden werden bei der Seuchenbekämpfung in bestimmten Umfange in Anspruch genommen.

Soweit die unteren kommunalen Verwaltungsbehörden zugleich Ortspolizeibehörden sind, z. B. in vielen Städten, haben sie aber auch die Gesundheitspolizei für ihren örtlichen Bezirk auszuüben.

Nach diesen einleitenden Bemerkungen, bei denen ich mich auf das kürzeste beschränken musste, möchte ich mich nun zu der Organisation der preussischen Medizinalverwaltung im Einselnen wenden. Wie dabei zunächst hervorzuheben ist, herrscht bei ihr der Grund-

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satz, dass die hygienischen Fachmänner im allgemeinen keine selbständig entscheidende Stellung haben, sondern dass sie nur die Berater der eigentlichen Verwaltungsbeamten sind. Diese Beratung wird ausgeübt, teils durch besonders vorgebildete Aerzte, die Medizinalbeamten, teils durch kollegiale Fachbehörden. Wenn nun auch die Verwaltungsbeamten keineswegs an die Ratschläge und Gutachten der Fachmänner gebunden sind, so darf ich doch sagen, dass ihre Ratschläge und Gutachten, soweit sie wohl begründet, zweckmässig und dem Rahmen der Staatsverwaltung angepasst sind, meist berücksichtigt werden.

An der Spitze der ganzen preussischen Medizinalverwaltung steht seit dem 1. April 1911 wieder der Minister des Innern. Dem vorher dafür zuständigen Minister der geistlichen und Unterrichtsangelegenheiten, dem u. a. auch die Universitäten und das Charitékrankenhaus in Berlin unterstehn, sind nur die Angelegenheiten des medizinischen, zahnärztlichen und pharmazeutischen Studiums einschliesslich der Vorprüfungen und der Verleihung des Professortitels, sowie der Erlaubnis zur Führung des ausländischen Doktor- oder Professortitels verblieben. Dagegen gehören die Hauptprüfungen der Medizinalpersonen und das ärtzliche Fortbildungswesen zum Geschäftkreis des Ministers des Innern. Das Militärsanitätswesen ist hingegen dem Kriegsminister, das Veterinärwesen dem Minister für Landwirtschaft, Domänen und Forsten unterstellt.

Der Minister des Innern hat sämtliche zum Gesundheitsschutz der Staatsangehörigen getroffenen oder zu treffenden Massregeln und Einrichtungen zu überwachen, er giebt die leitenden Grundzüge für alle neuen und wichtigen Verwaltungsmassnahmen an und führt die Oberaufsicht über das Heilpersonal. Er ist auch befugt, soweit die Gesetze ausdrücklich darauf verweisen, polizeiliche Vorschriften zu erlassen.

Die Medizinalabteilung des Ministeriums des Innern, in der alle diese Angelegenheiten bearbeitet werden, besteht aus einem Ministerialdirektor, dessen Stelle seit dem 1. Oktober 1911 zum ersten Male mit einem medizinisch vorgebildeten Fachmann besetzt ist, 5 vortragenden Räten, von denen 4 Mediziner, 1 Verwaltungsbeamter ist, dem Generalstabsarzt der Armee und mehreren technischen Hilfsarbeitern.

Dem Minister des Innern unmittelbar unterstellt und der Medizinalabteilung beigegeben sind drei kollegiate Fachbehörden, erstens die wissenschaftliche Deputation für das Medizinalwesen, welche schon 1808 ins Leben gerufen worden ist. Sie besteht aus einem Direktor, dessen Stelle stets von dem Direktor der Medizinalabteilung eingenommen worden ist. Sie besteht aus einem Direktor, dessen Stelle stets von dem Direktor der Medizinalabteilung eingenommen worden ist, 17 ordentlichen Mitgliedern, nämlich Mitgliedern der Medizinalabteilung und Berliner Universitätsprofessoren der Medizin

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(8) und Chemie (1), 1 ständigen Hülfsarbeiter und ausserordentlichen Mitgliedern, nämlich 12 Vertretern der Aerztekammern der Provinzen. Die wissenschaftliche Deputation für das Medizinalwesen soll in erster Linie ein Bindeglied zwischen der ärztlichen Wissenschaft und den Zwecken der des praktischen Lebens bilden. Ueber die ihr vom Minister vorgelegten Verhandlungen, Fragen und Vorschläge hat sie sich gutachtlich zu äussern und aus eigenem Antriebe Vorschläge zur Abstellung gesundheitlicher Mängel und zur Förderung der Zwecke der Medizinalverwaltung zu machen. Ausserdem hat sie gerichtlich-medizinische Obergutachten zu erstatten und die kreisärztlichen Prüfungen abzuhalten, deren Bestehn zur Anstellung als Medizinalbeamter erforderlich ist.

In ähnlicher Weise ist der seit 1896 bestehende Apothekerrat, der aus dem Direktor der Medizinalabteilung, den technischen vortragenden Räten und je 4 besitzenden und nicht besitzenden Apothekern zusammengesetzt ist, in Organisations- und Verwaltungsfragen des Apothekenwesens Berater des Ministers. Der Apothekerrat wird in der Regel einmal jährlich berufen.

Die schon 1832 eingesetzte technische Kommission für pharmazeutische Angelegenheiten dient dem Minister als Beirat für die laufenden Angelegenheiten auf diesem Gebiet und ist z. B. bei der Bearbeitung der jährlich neu herauszugebenden Arzneitaxe beteiligt. Diese Kommission besteht aus einem vortragenden technischen Rat der Medizinalabteilung, dem pharmazeutischen Hilfsarbeiter derselben und drei in Berlin-Charlottenburg ansässigen Apothekern.

Dem Minister sind ferner eine Reihe von Instituten und Anstalten unmittelbar unterstellt. Zunächst sind zwei wissenschaftliche Institute von besonderer Bedeutung zu nennen, nämlich erstens das 1891 in Verbindung mit dem Charitékrankenhaus in Berlin gegründete Institut für Infektionskrankheiten, für das 1901 ein eignes Heim im Norden Berlins eröffnet worden ist. Es umfasst 7 Abteilungen, deren jede einem auf dem betreffenden Gebiet bewährten Forscher untersteht, und dient in erster Linie der wissenschaftlichen Erforschung der Infektionskrankheiten. Ausserdem enthält es das bakteriologische Untersuchungsamt für einen Teil des Landespolizeibezirkes Berlin und eine Wutschutzstation für den grössten Teil der Monarchie. Die dem Institut angegliederte, unter Verwaltung des Rudolf Virchow Krankenhauses stehende Krankenabteilung besteht aus 6 Pavillons, die 138 Betten enthalten, und dem Obduktionshaus.

Das zweite Institut ist die 1901 ins Leben gerufene Königliche Versuchs- und Prüfungsanstalt für Wasserversorgung und Abwasserbeseitigung in Berlin. Sie zerfällt in 4 Abteilungen und hat die Aufgabe alle Vorgänge auf dem Gebiete der Wasserversorgung und der Beseitigung der Abfallstoffe hinsichtlich ihres gesundheitlichen

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und volkswirtschaftlichen Wertes zu verfolgen, neue Verfahren auf diesen Gebieten wissenschaftlich und technisch zu prüfen, einschlägige Projekte zu prüfen, bestehende Anlagen zu überwachen, den Zentralbehörden Gutachten im öffentlichen Interesse zu erstatten, Behörden und Privaten Auskunft und Rat zu erteilen.

Die wissenschaftlichen Arbeiten der Anstalt sind in den "Mitteilungen aus der Königlichen Prüfungsanstalt für Wasserversorgung und Abwässerbeseitigung," ferner in der Zeitschrift "Wasser und Abwasser" niedergelegt, während, wie ich vielleicht hier hinzufügen darf, das Ministerium des Innern das "Ministerialblatt für Medizinalangelegenheiten" und die "Veröffentlichungen aus dem Gebiete der Medizinalverwaltung" herausgiebt.

Ausserdem sind dem Minister des Innern noch folgende Anstalten unterstellt: Die hygienischen Institute in Posen, Benthen und Saarbrücken, die 11 Medizinaluntersuchungsämter und 2 Untersuchungsstellen, welche hauptsächlich die bakteriologischen Untersuchungen für die Seuchenbekämpfung auszuführen haben, das Lepraheim bei Memel, die 7 Impfanstalten, welche die Lympfe für die öffentliche Schutzpockenimpfung liefern, die 6 Quarantäneanstalten an der preussischen Küste, die 17 Kontroll- und Registrierstationen für Auswanderer und die 18 Desinfektorenschulen. Es steht ihm auch die Inanspruchnahme des Instituts für experimentelle Therapie in Frankfurt a. M. zu, zu dessen Tätigkeit die amtliche Prüfung aller der staatlichen Kontrolle unterstellten Heilsera gehört, sowie der Universitäts- und sonstigen Institute, soweit sie Aufgaben der Medizinalverwaltung erfüllen.

Im Vergleich mit diesem umfassenden Geschäftskreis der Zentralinstanz ist die Tätigkeit der Oberpräsidenten, welche an der Spitze der Verwaltung der einzelnen preussischen Provinzen stehn, auf gesundheitlichem Gebiete viel geringer. Der Oberpräsident führt die Aufsicht über die Tätigkeit der nachgeordneten staatlichen und kommunalen Behörden in dieser Beziehung. Hierzu gehört auch die Beaufsichtigung der Irren-, Epileptiker-, Blinden-, Taubstummen- und Hebammenlehranstalten, welche von der kommunalen Provinzialverwaltung unterhalten werden. Er ist befugt mit Zustimmung des Provincialrates Polizeiverordnungen für die ganze Provinz oder Teile davon zu erlassen. Derartige Polizeiverordnungen der Oberpräsidenten giebt es z. B. hinsichtlich der Krankenhäuser, der Berufspflichten der Hebammen, der ärztlichen Leichenschau. Eine besondere Befugnis steht ihm auf dem Gebiete des Apothekerwesens zu, nämlich die Genehmigung zur Errichtung neuer Apotheken und zur Verlegung bestehender. Ausserdem hat er den Vorsitz in dem Provinzialmedizinalkollegium und führt die Aufsicht über die Aerztekammer und das ärztliche Ehrengericht, sowie über die Apothekerkammer.

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Ein Medizinalbeamter ist ihm nicht beigegeben, dagegen kann er die Regierungs- und Medizinalräte der ihm unterstellten Regierungen zur Bearbeitung der Angelegenheiten des Gesundheitswesens heranziehn und hat in dem Provinzialmedizinalkollegium eine beratende Fachbehörde zu seiner Verfügung. Dieses besteht in der Regel aus dem Regierungs- und Medizinalrat am Amtssitze des Oberpräsidenten, 3 nebenamtlich angestellten Medizinalräten, die Universitätsprofessoren oder praktische Aerzte sind, und 3 Medizinalassessoren, darunter ein Apotheker und ein Tierarzt. Dazu kommen noch für ausserordentliche Sitzungen 2 von der Aerztekammer zu wählende Mitglieder. Die Tätigkeit der Provinzialmedizinalkollegien ist zwar nach ihrer Instruktion vom 23. Oktober 1817 recht umfassend, z. B. gehört die Begutachtung allgemeiner Massregeln zur Beförderung der medizinischen Wissenschaft, die Abgabe gutachtlicher Vorschläge zur Vervollkommung des Medizinal-Polizeiwesens der Provinz zu den Aufgaben dieser Collegien. In Wirklichkeit ist jetzt aber die Nachprüfung der gerichtsärztlichen Obduktionsverhandlungen und Entmündigungsgutachten, sowie die Abgabe von gerichtsärztlichen Obergutachten das Wichtigste ihrer Tätigkeit, und es sind schon seit längerer Zeit Stimmen dafür laut geworden die Provinzial-Medizinalkollegien ganz abzuschaffen.

Weit mehr als der Oberpräsident ist der Regierungspräsident auf dem Gebiet des öffentlichen Gesundheitswesens tätig. Er ist die eigentliche ausübende Aufsichtsinstanz. Von der Befugnis mit Zustimmung des Bezirksausschusses Polizeiverordnungen für den Regierungsbezirk oder mehrere Kreise desselben zu erlassen machen die Regierungspräsidenten auf gesundheitlichen Gebiete ausgiebigen Gebrauch. Sie sind auch befugt landespolizeiliche Verfügungen—landespolizeilich im Gegensatz zu ortspolizeilich, weil es sich um weitere Bezirke, nicht einen einzelnen Ort handelt—zu erlassen, eine Befugnis, die namentlich bei der Seuchenbekämpfung Anwendung findet. Der Aufsicht des Regierungspräsidenten untersteht ausser der eben genannten, sehr wichtigen Seuchembekämpfung: Das Impfwesen, die Trinkwasserversorgung, Abwasserbeseitigung, Nahrungsmittelverkehr, Arzneimittelverkehr in Apotheken und Drogenhandlungen, die beamteten Aerzte und das sonstige Heilpersonal, die Krankenhäuser, Privatirrenanstalten, das Rettungswesen, die sittenärztliche Controlle, die Gefängnisse, soweit sie dem Minister des Innern unterstehn, die Badeanstalten u. a. m. Die Schulen unterstehn auch in gesundleitlicher Beziehung den Kirchen- und Schulabteilungen der königlichen Regierungen. Als medizinisch-technischer Beirat ist dem Regierungspräsidenten ein Regierungs- und Medizinalrat und bei 6 grossen Regierungen ausserdem ein Kreisarzt als ständiger medizinischer Hülfsarbeiter beigegeben, welche die einschlägigen Angelegen-

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heiten zu bearbeiten, und dabei auch eine ganze Reihe von Besichtigungen z. B. aller Apotheken mit einem Apotheker zusammen auszuführen haben.

Während die bisherigen utachten besprochene Organisation der Medizinalverwaltung auf Bestimmungen beruht, ist in der untern Instanz eine Mitte des vorigen Jahrhunderts, teils aus dem Anfange und der Reorganisation des Jahres 1901 in Kraft getretene Kreisarztgesetz erfolgte, wie aber der Landrat und die ändlichen Ortspolizeiverwaltung hat die Polizeiverwaltungsbehörden und Exekutivbefugnis allgemeinen Selbständigkeit und halten, aber der Kreisbeamte in der Kreisanz, der alten Besoldung in en Initiativ Posen, hat sich die meisten Kreisämter und ist der ng des Kreisarzt bakteriologisch technische liche stattzuführen hat aber nicht r des Landrats, welche die Lymittelbar Behörde der die 6 Quare approllt. Zu Medizinalbeamte, troll- und Regierungsprobaerzte in Anstellungsschulen. Es Tätigkeit für experimentierende Ärzte, die amtlichst- praktische Tätigkeit die Heilsera geh aber , ist der Kreisarzt soweit sie Aufgaben der Stufe dem Hilfsarbeiter Die ommt, darf der Kreisarzt deten Kreisen. gestiegen. cht vollbesoldeten tliche Tätigkeit zu als Commissar der kreisärztlichen starken

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Der Kreisarzt hat die An- und Abmeldungen der Aerzte, Apotheker, Hebammen, Heilgehülfen und der nicht approbierten Heilpersonen entgegenzunehmen und über sie genaue Verzeichnisse zu führen. Dem Treiben der Kurpfuscher hat er besondere Aufmerksamkeit zu widmen. Alle Apotheken hat er jährlich einmal unvermutet zu mustern, die Drogen- und Gifthandlungen nach Massgabe der besonderen Vorschriften darüber zu besichtigen, die Personen, welche die gesetzlich erforderliche Genehmigung zum Gifthandel nachsuchen, zu prüfen. Die Berufstätigkeit der Hebammen hat er zu überwachen, alle sich zur Ausbildung als Hebamme meldenden Personen zu prüfen, die vorhandenen Hebammen in der Regel alle 2 Jahre nachzuprüfen. Ebenso hat er die amtlichen Desinfektionen alle 3 Jahre nachzuprüfen. Die einzelnen Ortschaften seines Amtsbezirkes soll er in der Regel alle 5 Jahre auf ihre gesundheitlichen Verhältnisse besichtigen. Der Beschaffenheit der Wohnungen soll er vom gesundheitlichen Standpunkte an der Hand der bestehenden einzelnen kreispolizeilichen Vorschriften seine Fürsorge zuwenden. Ich bemerke dabei, dass ein Wohnungsgesetz in Vorbereitung ist. Die vorhandenen Trinkwasserversorgungsanlagen hat der Kreisarzt zu überwachen und über alle Projekte zu zentralen Wasserversorgungsanlagen sich gutachtlich äussern. Eine ministerielle Anleitung für die Einrichtung, den Betrieb und die Ueberwachung öffentlicher Wasserversorgungsanlagen dient dabei als Grundlage. Ebenso sind durch Ministerialerlass die Gesichtspunkte für die Begutachtung von Canalisationsprojekten gegeben. Die Durchführung der von meinem Herrn Vorredner erwähnten Reichsgesetse über den Verkehr mit Nahrungsmitteln, Wein, Süssstoff und der dazu erlassenen preussischen Ausführungsbestimmungen hat er nach Kräften zu unterstützen. Namentlich der Verkehr mit Milch, für den kürzlich neue Grundzüge durch Ministerialerlass bekannt gegeben sind, verlangt die besondere Aufmerksamkeit des Kreisarztes.

Eine besonders wichtige Aufgabe fällt ihm bei der Seuchenbekämpfung zu. Ausser dem von dem Herrn Vorredner erwähnten Reichsseuchengesetz, das vorwiegend gegen die exotischen Krankheiten, wie Cholera, Pest gerichtet ist, haben wir ein preussisches Gesetz betreffend die Bekämpfung übertragbarer Krankheiten vom 28. August 1905, welches sich auf die wichtigsten einheimischen Krankheiten, wie Scharlach, Diphtherie, Unterleibstyphus, übertragbare Genickstarre, Ruhr, Milzbrand, Tollwut u. a. bezieht. Aehnlich wie das Reichsseuchengesetz enthält das preussische Seuchengesetz Bestimmungen über die Anzeigepflicht, Ermittelungen, die von den Polizeibehörden anzuordnenden Schutzmassregeln, die Absonderung, Desinfektion, Beschränkung des Gewerbebetriebes u. s. w., ferner über die zu gewährenden Entschädigungen und Kosten.

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Sache des Kreisarztes ist es besonders die erforderlichen Ermittelungen über Art, Stand und Ursache der Krankheiten anzustellen, der Polizeibehörde Vorschläge über die zu treffenden Schutzmassregeln zu machen und bei deren Durchführung die Polizeibehörde zu unterstützen. Bei Gefahr im Verzuge kann der Kreisarzt vorläufige Anordnungen selbständig treffen. Das Impfgeschäft—wir haben durch das Reichsimpfgesetz und das preussische Impfgesetz einen Impfzwang—hat er technisch zu beaufsichtigen, Impfschäden festzustellen, die Impfärzte zu revidieren.

Die Ueberwachung der Prostitution hat der Kreisarzt nach Kräften zu unterstützen. Die Prostituierten werden in Preussen an den Orten, für die es vorgeschrieben ist (Orten mit mehr als 6,000 Einwohnern, Garnisonorten, bei besonderen Verhältnissen) polizeilich überwacht und einer regelmässigen sittenärztlichen Untersuchung unterworfen. Bordelle sind in Preussen unzulässig. Geschlechtskranke Dirnen können in geeignete Krankenhäuser überführt werden.

Auf dem Gebiete der Gewerbehygiene, auf welche sich ausser den von meinem Herrn Vorredner erwähnten reichsgesetzlichen Vorschriften noch eine Reihe von Ministerialerlassen und anderer preussischer Bestimmungen beziehn—vor allem handelt es sich um den Arbeiterschutz in besonders gefährlichen Betrieben wie Glashütten, Buchdruckereien, Schleifereien u. a. um die Unfallverhütung—steht dem Kreisarzt eine gewisse Mitwirkung zu. Unter anderem hat er sich bei der Konzessionierung der Konzessionspflichtigen Gewerbebetriebe gutachtlich zu äussern. Die Schulhygiene ist gleichfalls ein wichtiges Feld seiner Tätigkeit. Innerhalb eines in der Regel fünfjährigen Zeitraumes hat er jede Schule seines Amtsbezirkes zu besichtigen und Vorschläge für die Abstellung der gefundenen gesundheitlichen Mängel zu machen. Alle Pläne für Schulen- und -erweiterungsbauten hat er vom gesundheitlichen Standpunkte zu begutachten. Eine ministerielle Denkschrift über den Bau ländlicher Volksschulen enthält die dabei für die Schulen zu berücksichtigenden Gesichtspunkte. Zur Verhütung der Verbreitung übertragbarer Krankheiten durch die Schulen ist eine besondere ministerielle Anweisung erlassen, bei deren Durchführung der Kreisarzt mitzuwirken hat.

Die Haltekinderstellen hat er nach Bedarf zu besichtigen, die Säuglings- und Krüppelfürsorge zu unterstützen.

Die Kranken- und ähnliche Anstalten seines Amtsbezirkes hat er jährlich mindestens einmal zu besichtigen. Die Pläne für Neu- oder Erweiterungsbauten der Krankenhäuser hat er zu prüfen. Für die Beaufsichtigung von Privatanstalten für Geisteskranke, Epileptische und Idioten bestehn Sondervorschriften. Die Geisteskranken in Familienpflege hat er gemäss der in den einzelnen Regierungsbezirken erlassenen Bestimmungen zu beaufsichtigen.

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Die Badeanstalten hat er nach Bedarf zu besichtigen, die Bade- und Kurorte mindestens einmal jährlich. Für letztere sind bestimmte Mindestforderungen in gesundheitlicher und baulicher Hinsicht von der Zentralinstanz aufgestellt.

Bei Beförderung von Leichen, für welche in der Regel ein Leichenpass nötig ist, hat der Kreisarzt sich gutachtlich zu äussern, ebenso bei der Verbrennung von Leichen, die seit kurzem in Preussen gesetzlich zulässig ist. Auch bei der Anlegung neuer und der Erweiterung bestehender Begräbnisplätze hat er sein Gutachten abzugeben. Als Grundlage dafür dienen ihm die von der Zentralinstanz bekannt gegebenen Gesichtspunkte. Die ärztliche Leichenschau ist nur in einigen Teilen von Preussen eingeführt.

Damit die Kreisärzte auf der Höhe der Wissenschaft gehalten werden, sind regelmässige Fortbildungskurse für sie eingerichtet, für die z. B. im diesjährigen Etat 25,000 M. eingestellt sind.

Schliesslich ist noch einer organisatorischen Einrichtung zu gedenken, welche eine Annäherung der staatlichen Medizinalorgane an die Selbstverwaltungskörper bezweckt, nämlich der Gesundheitskommissionen, die durch das Kreisarztgesetz an Stelle der früheren Sanitätskommissionen (des Regulativs vom 8. August 1835) eingesetzt worden ist.

Die Gesundheitskommission, welche für jede Stadt- oder Landgemeinde von mehr als 5,000 Einwohnern gebildet werden muss, in kleineren Gemeinden gebildet werden kann, hat die Aufgabe von den gesundheitlichen Verhältnissen des Ortes durch gemeinsame Besichtigungen sich Kenntnis zu schaffen, die Massnahmen der Polizeibehörde insbesondere bei der Seuchenbekämpfung z. B. durch Untersuchung von Wohnungen, Belehrung der Bevölkerung zu unterstützen, über alle ihr von den Behörden vorgelegten Fragen des Gesundheitswesens sich gutachtlich zu äussern und Vorschläge auf dem Gebiete des Gesundheitswesens zu machen.

Jeder Gesundheitskommission soll nach Möglichkeit ein Arzt und ein Bausachverständiger angehören. In grösseren Städten können auch Unterkommissionen gebildet werden.

Das Verhältnis zwischen Gesundheitskommission und Kreisarzt ist derart, dass der letztere an allen Sitzungen der Gesundheitskommission, die mindestens alle drei Monate statt finden sollen, teil nehmen und jederzeit ihre Zusammenberufung verlangen kann. Ferner hat der Kreisarzt bei allen Verhandlungen der Gesundheitskommission beratende Stimme, und die Gesundheitskommission hat ihrerseits an den regelmässigen Ortsbesichtigungen des Kreisarztes auf seine Einladung nach Möglichkeit teil zu nehmen.

Nur in kurzen Umrissen habe ich die Organisation des öffentlichen Gesundheitswesens in Preussen behandeln können. Wenn ich das Gesagte noch einmal zusammenfassen darf, so haben in Preussen die

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Behörden der inneren Verwaltung auch die Angelegenheiten des öffentlichen Gesundheitswesens zu verwalten. Die medizinisch vorgebildeten Fachmänner sind im allgemeinen nur die Berater dieser Behörden.

Die Zentralinstanz (der Minister des Innern) hat die oberste Litung der gesamten Medizinalverwaltung ein, schliesslich der Gesund. heitspolizei. Die mittlere Instanz (Oberpräsident, Regierungspräsident) ist vorwiegend eine Aufsichtsinstanz, die untere Instanz (Landrat, Ortspolizeibehörde) führt hauptsächlich die gesundheitsgesetzlichen Bestimmungen aus, wobei der Kreisarzt als Gesundheitsbeamter mitwirkt. Die Beschaffung der zum Gesundheitsschutze der Staatsangehörigen erforderlichen Einrichtungen liegt hauptsächlich den Communalverbänden ob.

ÜBER DIE ORGANISATION UND DIE VERWALTUNGSMASSNAHMEN DER LOKALEN VERWALTUNGSBEZIRKE (INSBESONDERE DER STÄDTE) AUF DEM GEBIETE DER ÖFFENTLICHEN GESUNDHEITSPFLEGE.

Dr. Fritz Kirstein, Kreisarzt für Stettin-Ost und Vorsteher des Königl. Medizinaluntersuchungsamtes in Stettin.

Die Organisation und die Tätigkeit der lokalen Gesundheitsbehörden ist naturgemäss abhängig von der historischen Entwickelung und der Struktur der lokalen Verwaltung überhaupt und ist daher unter diesem Gesichtspunkte zu beurteilen.

Als Angehöriger des grössten Bundesstaates des Deutschen Reiches Preussen möchte ich mit wenigen Grundlinien ein Bild von dem gegenwärtigen Stadium der Entwickelung der Organisation und Verwaltung eines lokalen Bezirkes insbesondere einer Stadt zu entwerfen suchen.

Man hat zunächst zu unterscheiden ob es sich um die Medizinalverwaltung eines ländlichen Bezirkes, eines Landkreises, oder einer grösseren Stadt handelt.

In den Landkreisen liegt dem Verwaltungschef des Kreises, dem Landrat, einem meist juristisch vorgebildeten Beamten, der gleichzeitig Organ der Staatsregierung und Leiter der Kommunalverwaltung des Kreises ist, die verantwortliche Leitung der Medizinal- und Sanitätspolizei ob.

Als technischer Beamter ist ihm ein staatlicher Gesundheitsbeamter. der Kreisarzt, beigegeben, der der nächst höheren Verwaltungsinstanz, dem Regierungspräsidenten, unterstellt ist.

Wenn nun auch der Landrat das ausführende Organ der Medizinal- und Sanitätspolizei ist, so werden doch alle die öffentliche Gesundheitspflege berührenden Fragen von dem Kreisarzt bearbeitet und

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seine Vorschläge in der Regel durchgeführt, sofern nicht andere verwaltungsrechtliche Bedenker und namentlich Forderungen erheblicher Geldmittel dem Verwaltungschef die Durchführung des seitens des Medizinalbeamten vorgeschlagenen Massnahmen untunlich erscheinen lassen.

Die Abgrenzung der Rechte und Pflichten der Kreis-Gesundheitsbeamten ist in Preussen durch ein besonderes Gesetz, betr. die Dienststellung des Kreisarztes und die Bildung von Gesundheitskommissionen vom 16. September 1899 in Verbindung mit einer dazu ergangenen das Gesetz näher erläuternden Dienstanweisung vom 23. März 1901 in der Fassung vom 1. September 1909, niedergelegt.

Hiernach hat der Medizinalbeamte seine Aufgabe hauptsächlich darin zu erblicken, dass er gestützt auf seine technischen Kenntnisse und praktischen Erfahrungen, sowie auf die Vertrautheit mit den örtlichen Verhältnissen und den einschlägigen gesetzlichen Bestimmungen der zuständigen Behörde mit sachverständigem Rat zur Seite steht, ihnen gegenüber die zur Beseitigung sanitärer Missstände und zur Förderung der öffentlichen Gesundheitspflege erforderlichen hygienischen Massnahmen überzeugend begründet und sie bei deren Durchführung in jeder Weise unterstützt. Seine Tätigkeit ist also in erster Linie eine beratende und überwachende; er hat jedoch auch das Recht, selbstständig Anordnungen zu treffen in denjenigen Fällen, wo beim Ausbruch von ansteckenden Krankheiten Gefahr im Verzuge ist.

In der ziemlich umfangreichen Dienstanweisung sind alle auf das Gesundheitswesen bezüglichen in den einschlägigen Reichs- und Landesgesetzen, Ministerialerlassen, u. s. w. enthaltenen Bestimmungen zu einer organischen Verarbeitung gebracht und geben dem Medizinalbeamten eine vortreffliche Richtschnur für seine praktische Tätigkeit an die Hand.

Auf die wichtigsten Bestimmungen der Dienstanweisung soll später noch kurz Bezug genommen werden.

Der grosse Umfang der in ihr von den Kreisärzten verlangten Dienstgeschäfte lässt es begreiflich erscheinen, dass selbst in kleinen ländlichen Kreisen der Medizinalbeamte dienstlich voll in Anspruch genommen ist.

Vielfach bedient sich derselbe daher auch schon in manchen Landkreisen besonderer Hilfsorgane, sogenannter Gesundheitsaufseher, welche den Kreisarzt bei Beaufsichtigung gesundheitlich wichtiger Anlagen und Einrichtungen unterstützen, ihm über ihre Beobachtungen Bericht erstatten und die Abstellung von Mängeln, deren Beseitigung angeordnet war, überwachen.

In den Stadtkreisen, in den Städten, wachsen die auf gesundheitlichem Gebiete zu leistenden Aufgaben mit der Grösse der Stadt. Es haben sich daher für die grösseren Städte besondere Verhältnisse

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entwickelt, die zu einer Verteilung der Arbeitsleistungen auf dem Gebiete der öffentlichen Gesundheitspflege geführt haben und zwar ist die Gliederung um so reich verzweigter, je grösser das betreffende Gemeinwesen ist.

Zum Verständnis der Verhältnisse, wie sie sich in den preussischen grösseren Städten und Grossstädten entwickelt haben, muss ich einige allgemeine Bemerkungen vorausschicken.

Während in den Landkreisen, wie erwähnt, der Landrat gleichzeitig Organ der Staatsverwaltung, daher Inhaber der Polizeigewalt und Leiter der Kommunalverwaltung des Kreises ist, ist in grösseren Städten eine Trennung der beiden Funktionen dergestalt herbeigeführt, dass ein Polizeidirektor bezw. Polizeipräsident die rein polizeilichen Angelegenheiten wahrzunehmen hat, also auch die der Medizinal- und Sanitätspolizei, dagegen ein Bürgermeister bezw. Oberbürgermeister als Leiter der Kommunalverwaltung die übrigen die Wohlfahrt der Bürger betreffenden Angelegenheiten zu ordnen hat.

Diese Teilung der Verwaltungsorganisation der grösseren Städte konnte naturgemäss auch auf die Verwaltung und Durchführung der öffentlichen Gesundheitspflege nicht ohne Rückwirkung bleiben und so ist auch hier eine Trennung der Funktionen, wahrgenommen von den staatlichen Ärzten einerseits und städtischen Ärzten andererseits vor sich gegangen.

Als technischer Berater des Polizeidirektors bezw. Polizeipräsidenten fungiert auch hier wieder der staatliche Gesundheitsbeamte, der Kreisarzt. Für sehr grosse Städte, z. B. Berlin, Cöln, Breslau, u. s. w. sind entsprechend mehrere Kreisärzte und zwar jeweils für bestimmte Stadtbezirke bestellt. Für sie gilt ebenfalls die schon erwähnte Dienstanweisung, die von ihnen *mutatis mutandis* auch auf die Städte anzuwenden ist.

Von den staatlichen Gesundheitsbeamten sind zunächst gemäss der Dienstanweisung die Geschäfte der Medizinalpolizei wahrzunehmen.

Demgemäss hat der für einen Stadtbezirk bestellte Kreisarzt über das gesamte Medizinalpersonal, Ärzte, Zahnärzte, Apotheker, Hebammen, u. s. w. für jede Berufsart getrennt, fortlaufende Verzeichnisse zu führen, aus welchen jederzeit der augenblickliche Personalbestand ersichtlich ist. Er hat über die Tätigkeit derjenigen Personen, welche ohne als Arzt approbiert zu sein die Heilkunde ausüben, zu wachen und Verstösse derselben gegen die einschlägigen Bestimmungen der Reichsgewerbeordnung und des Strafsgesetzbuches der zuständigen Behörde mitzuteilen.

Ferner hat er die Aufsicht über das Apothekerwesen zu führen. Er hat den Geschäftsbetrieb der Apotheken zu überwachen und alle

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Apotheken seines Bezirkes einmal jährlich zu besichtigen. Er hat die Ausbildung der Apothekerlehrlinge zu verfolgen, die etwa notwendig werdende Neuanlage von Apotheken rechtzeitig zur Sprache zu bringen.

Bezüglich der Überwachung des Arzneimittelverkehrs, sowie des Handels mit Giften ausserhalb der Apotheken, hat er darüber zu wachen, dass die einschlägigen Bestimmungen der Reichsgewerbeordnung, des Strafgesetzbuches und der Ministerial-Polizeiverordnung beachtet werden. Inbezug auf seine Beteiligung bei der Besichtigung der Drogen- u. Farbwaren-Handlungen bestehen noch besondere Vorschriften.

Sämtliche Hebammen unterstehen der Beaufsichtigung durch den Kreisarzt, der ihre Berufstätigkeit die gehörige Instandhaltung ihrer Instrumente überwacht und insbesondere auch darauf achtet, dass sie die Vorschriften ihres Lehrbuches streng innehalten. Ferner hat er alle zwei Jahre die Hebammen einer Nachprüfung zu unterziehen und denjenigen Hebammen, welche ungenügende Kenntnisse und Fertigkeiten zeigen, die Teilnahme an einem Wiederholungslehrgang aufzugeben.

Die Tätigkeit der staatlich geprüften Krankenpflegepersonen hat er zu überwachen, und bei nachweislicher Unzuverlässigkeit einer solchen Person die Zurücknahme der Anerkennung zu veranlassen.

Der Kreisarzt hat ferner darauf hinzuwirken, dass seitens der Stadt hinreichendes staatlich geprüftes Desinfektionspersonal zur Verfügung steht. Letzteres untersteht zwar der städtischen Verwaltung, ist aber durch den Kreisarzt von drei zu drei Jahren einer Nachprüfung zu unterziehen.

Die ureigenste Domäne für den staatlichen Gesundheitsbeamten ist das Gebiet der Verhütung und Bekämpfung übertragbarer Krankheiten. Er hat insbesondere darüber zu wachen, dass die einschlägigen gesetzlichen und Verwaltungsvorschriften genau beachtet werden. In dieser Hinsicht kommen in Betracht das Reichsgesetz betr. die Bekämpfung gemeingefährlicher Krankheiten vom 30. Juni 1900 und das preussische Gesetz betr. die Bekämpfung übertragbarer Krankheiten vom 28. August 1905. Hiernach hat er insbesondere auf die Innehaltung der Anzeigepflicht der ansteckenden Krankheitsfälle zu achten. Bei seinen an Ort und Stelle vorzunehmenden Ermittelungen hat er die Art und die Ursache der Krankheit festzustellen. Endlich hat er die nötigen Schutzmassregeln anzuordnen oder wenigstens der Polizeibehörde in Vorschlag zu bringen.

Bei der Überwachung der Prostitution hat er darauf zu achten, dass seitens der Sittenärzte eine vorschriftsmässige Untersuchung der Dirnen und eventuell deren Behandlung in einem Krankenhause stattfindet.

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Auf dem Gebiete der Gewerbehygiene hat der Kreisarzt bei der Konzessionierung einer grossen Anzahl gewerblicher Anlagen gemäss den Ausführungsbestimmungen zur Reichsgewerbeordnung mitzuwirken. Auch bei der Gewerbeaufsicht selbst hat er mitzuwirken, soweit es sich um Betriebe handelt, die die öffentliche Gesundheit oder der darin beschäftigten Arbeiter zu schädigen geeignet sind. Er hat sich dabei allerdings mit dem Gewerbeinspektoren in Verbindung zu setzen.

Bei der Überwachung des Verkehrs mit Nahrungs-Genussmittel und Gebrauchsgegenstände, der eine reichsgesetzliche Regelung erfahren hat, hat er sich darüber zu vergewissern, dass die vorgeschriebenen regelmässigen Untersuchungen von Nahrungsmitteln, Genussmitteln, und Gebrauchsgegenständen ausgeführt werden und dass eine sachgemässe Probeentnahme erfolgt, die gewöhnlich durch besonders instruierte Polizeiorgane vorgenommen wird. Die Untersuchungen selbst erfolgen entweder in staatlichen oder städtischen Untersuchungsanstalten, mit denen besondere Verträge abgeschlossen sind.

Der Verkehr mit Milch ist der Beaufsichtigung des Kreisarztes in Gemeinschaft mit dem beamteten Tierarzt unterworfen, während die Überwachung des Verkehrs mit Fleisch, der Einrichtung und des Betriebs der Schlachthäuser in erster Linie Sache des beamteten Tierarztes ist.

Auf den übrigen Gebieten der öffentlichen Gesundheitspflege hat sich der Staat mit Hilfe seiner Organe der Kreisärzte im Wesentlichen nur die Aufsicht über die von den Gemeinden bezw. Städten geschaffenen Einrichtungen vorbehalten, wobei der staatliche Gesundbeamte hauptsächlich darauf zu achten hat, dass die in den einschlägigen Bestimmungen normierten Mindestanforderungen erfüllt sind. In den für jede Stadt zu bildenden Gesundheitskommissionen bietet sich indess dem Kreisarzte bezw. den Kreisarzten Gelegenheit, Anregungen und Vorschläge auf dem Gebiete des öffentlichen Gesundheitswesens zu machen.

Es verbleibt daher den Städten noch ein weites Feld zur Betätigung auf dem Gebiete der öffentlichen Gesundheitspflege, welche sie auch dank ihrer Selbstverwaltung in weitgehendstem Maasse in Preussen und Deutschland entfaltet haben und noch weiter entfalten.

Die Aufgaben, welche in dieser Beziehung die Städte erfüllen, lassen zwei Richtungen unterscheiden, eine medizinische, d. i. die Versorgung der Erkrankten, und eine hygienische, d. i. der Schutz der Gesunden vor den spezifischen Gefahren, welche das Zusammenleben in einer grossen Gemeinschaft herbeiführt. Beide Aufgaben fallen in dasjenige Gebiet der Hygiene, welches man gegenwärtig als das Sondergebiet der sozialen Hygiene bezeichnet.

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Zu den wichtigsten und gleichzeitig zu den kostspieligsten Einrichtungen, die die Stadtverwaltungen zu treffen haben, gehört das Krankenhauswesen. Die öffentlichen Krankenhäuser haben in erster Linie die Aufgabe, weniger bemittelten und armen Kranken eine zweckmässige Behandlung und Pflege angedeihen zu lassen. In der Regel wird für diese Anstalten das allgemeine Krankenhaus zu wählen sein, das selbstverständlich mit Isolierabteilungen für ansteckende Kranke versehen sein muss. Doch wird man in Grossstädten zweckmässig auf die Einrichtung von Spezialkrankenhäuser z. B. für Genesende, Tuberkulöse, Geschlechtskranke u. s. w. Bedacht nehmen. Wenn diese in der Anlage auch kaum billiger herzustellen sein dürften, so werden sie durch den einfacheren Versorgungstypus im Betrieb weit weniger kostspielig.

Während die Unterbringung und Versorgung der Siechen und Krüppel noch Aufgabe der Kreise bezw. Städte ist, ist die Bereitstellung und Verwaltung der Anstalten für Blinde, Taubstumme, und Geisteskranke Sache der Provinz.

In enger Verbindung mit dem Krankenhauswesen steht der Krankentransport- und Rettungsdienst. Eine zweckmässige Organisation ist hier von besonderer Wichtigkeit, um namentlich die in der Industrie und im Strassenverkehr Verletzten eine möglichst schnelle und sachgemässe Hilfe angedeihen lassen zu können. In Verbindung mit der Regelung des Krankentransport- und Rettungsdienstes, der wohl am besten durch die Stadt selbst in eigener Verwaltung wahrgenommen wird, empfiehlt sich die Einrichtung einer Zentrale für Krankenmeldung, wo jederzeit die in den einzelnen Krankenhäusern zur Verfügung stehenden freien Betten bekannt sind, damit Schwerkranke nicht vergeblich von einem Krankenhaus zum anderen transportiert werden müssen, bis sie endlich Aufnahme finden können.

Die Versorgung der Armenkranken geschieht durch die Armenärzte, soweit nicht für dieselben Krankenhausbehandlung erforderlich ist. Da der armenärztliche Dienst kein rein ärztlicher ist, sondern auch die Aufgabe eines sachverständigen Beraters für die Armenverwaltung bei Fragen wie Bedürftigkeit, Wohnungsmängel, u. s. w. in sich schliesst, haben die Städte meist Bezirksarmenärzte angestellt und verhalten sich der Einführung der freien Arztwahl gegenüber entschieden ablehnend.

Mit dem armenärztlichen Dienst vereinigt ist oft derjenige der Impfärzte, welche die gesetzlich vorgeschriebenen Impfungen der Erst- und Wiederimpflinge in regelmässigen Impfterminen ausführen. Diese Aufgabe ist der Gemeinde übertragen worden, obwohl sie als eine Massnahme zur Bekämpfung ansteckender Krankheiten zu den Aufgaben des Staates gehört und daher streng genommen von den Kreisärzten bezw. deren Hilfsärzten ausgeführt werden müssten.

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Eine wichtige Aufgabe auf dem Gebiete der Krankenfürsorge erwächst noch den Kreisen bezw. Städten in der Ausbildung und Anstellung von Gemeindepflegerinnen zur Übernahme der Hauskrankenpflege.

Das andere grosse Arbeitsgebiet der Städte betrifft die Verhütung von Krankheiten und die Hebung der Gesundheit der Einwohner.

Dahin gehört zunächst die Schaffung und Unterhaltung ausreichender und einwandsfreier Wasserversorgungsanlagen, ferner eine rasche zweckmässige Beseitigung der festen und flüssigen Abfallstoffe. Welche Systeme hier zu wählen sind, richtet sich nach den besonderen örtlichen Verhältnissen.

Wie die Strassenreinigung und die Beseitigung des Strassenkehrichts durch die Städte, trägt auch die Beseitigung des Hausmülls durch dieselben den gesundheitlichen Forderungen am besten Rechnung. Sie ist deshalb auch fast überall in städtische Regie übernommen.

Das Interesse der Städte an einer gesundheitlich einwandsfreien Gestaltung des Fleischverkehrs hat zu einer Zentralisierung des Schlachthausbetriebes, zur Errichtung öffentlicher Schlachthäuser seiten der Städte geführt. Nur so sind die Garantien gegeben, dass die erforderlichen Untersuchungen des Fleisches zweckentsprechend und sorgfältig ausgeführt werden.

Zu den weiteren die Verhütung von Krankheiten bezweckenden Einrichtungen gehören die Desinfektionsanstalten. Zwar ist es Aufgabe des Staates bezw. der staatlichen Ärzte, die Bekämpfung der Seuchen an der Hand der gesetzlichen Bestimmungen zu bewirken, jedoch hat sich der Staat nur die Überwachung der dazu dienenden Einrichtungen vorbehalten, sodass auch die Desinfektionsanstalten selbst in Deutschland von den städtischen Verwaltungen errichtet und geleitet werden.

Ferner haben es die grösseren Städte in neuerer Zeit als eine ihrer Aufgaben auf hygienischem Gebiete angesehen, in eigenen Untersuchungsanstalten die chemische Prüfung von Nahrungsmittel und Gebrauchsgegenstände und die bakteriologischen Untersuchungen, soweit hierfür nicht staatliche Untersuchungsämter vorhanden sind bezw. vertraglich diese Untersuchungen für die Städte ausführen, zu übernehmen.

Eine der wichtigsten und umfassendsten Aufgaben haben die Städte auf dem Gebiete des Wohnungswesens zu erfüllen. Grundlegend für die Kommunalhygiene ist die rechtzeitige Feststellung zweckentsprechender, den gesundheitlichen Anforderungen Rechnung tragender Bebauungspläne. Vor allem ist auf eine zweckentsprechende Abstufung der Bauordnung, der Unterscheidung von Wohn- und Verkehrsstrassen, der Fernhaltung von belästigenden Betrieben

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von Wohnstrassen, die Anlage von freien Plätzen u. s. w. Bedacht zu nehmen.

Auf dem Gebiete der Wohnungsfürsorge bleibt neben den Massnahmen zur Verbilligung des Wohnungsbaues das wichtigste eine regelmässige Wohnungszählung und eine fortlaufende Wohnungskontrolle. Letztere setzt, da in den meisten deutschen Bundesstaaten gesetzliche Bestimmungen über das Wohnungswesen fehlen, den Erlass lokaler Wohnungsordnungen voraus, welche die Mindestforderungen an die gesundheitliche Beschaffenheit der Wohnungen nach Raum, Inhalt, u. s. w. festlegen. Eine kommunale Wohnungsaufsicht setzt ferner voraus, dass der Gemeinde das Recht zusteht, ungesunde Wohnungen räumen zu lassen. Hierzu ist eine staatliche Bevollmächtigung und damit die Heranziehung staatlicher Mitwirkung erforderlich. Da für die geräumten Wohnungen Ersatz geschaffen werden muss, ist ein amtlicher Wohnungsnachweis und die Fürsorge für die Errichtung billiger Wohnungen für die ärmere Bevölkerung zu betreiben.

Allen diesen Forderungen wird wohl am besten ein besonderes Wohnungsamt gerecht, wie solche schon in einigen Grossstädten eingerichtet und im grösseren Umfange bereits geplant sind. Das Wohnungsamt bedient sich zur Durchführung seiner Aufgaben besonderer Unterkommissionen, welche nach Art der Armenkommissionen die einzelnen Stadtbezirke mit einer gewissen Selbstständigkeit verwalten und denen zweckmässig der betreffende Armenarzt als ärztlicher Berater beigegeben ist. Als ausführende Organe des Wohnungsamtes fungieren je nach der Grösse der Stadt ein oder mehrere Wohnungsinspektoren, welche mit obrigkeitlicher Vollmacht versehen, die Besichtigungen der Wohnungen vornehmen.

Mit Recht betrachten die Städte als eine wichtige kommunalhygienische Aufgabe die Säuglingsfürsorge. Diese Säuglingsfürsorgestellen sind Beratungsstellen, deren Hauptaufgabe es ist, durch Stillprämien die natürliche Säuglingsernährung volkstümlich zu machen, dann die unerfahrenen Mütter in Bezug auf die Haltung des gesunden und kranken Säuglings beraten, mit zweckmässiger Nahrung versorgen und dadurch der Säuglingssterblichkeit entgegen wirken sollen. In den meisten deutschen Grossstädten ist jetzt ein Netz derartiger Säuglingsfürsorgestellen errichtet worden, welche teilweise unmittelbar in städtischer Verwaltung stehen, teilweise von Wohlfahrtsvereinen mit städtischer Beihülfe unterhalten werden und deren ärztliche Leitung meist in den Händen von Kinderärzten liegt. Diese Massnahmen der Säuglingsfürsorge finden in den Grossstädten ihre Ergänzung in der Einrichtung von Säuglingsheimen und Säuglingskrankenhäusern. In denjenigen Städten, wo eine

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geordnete Säuglingsfürsorge besteht, ist jetzt meist auch das Ziehkinderwesen in diese Fürsorge einbezogen. Letzteres ist in besonders vorbildlicher Weise in Leipzig geregelt.

Eine weitere Aufgabe gesundheitlicher Fürsorge erfüllen die Städte durch das Schularztwesen, das jetzt fast in allen Städten, wenn auch in etwas verschiedener Form, zur Durchführung gelangt ist. Man unterscheidet nämlich das "Wiesbadener" System, bei welchem Schulärzte im Nebenamt und das "Mannheimer" System, bei dem ein oder erforderlichenfalls mehrere Schulärzte im Hauptamte eingestellt sind.

Das gegenwärtige Schularztwesen leidet noch an dem erheblichen Mangel, dass gesundheitliche Missstände bei den Kindern zwar festgestellt, aber nach Mitteilung an die Eltern vielfach nicht abgestellt werden. Nur hinsichtlich der Erkrankungen der Zähne haben neuerdings zahlreiche Grossstädte die Behandlung der Schulkinder durch die Errichtung besonderer Schulzahnkliniken übernommen. Es ist zu hoffen, dass sich das Schularztwesen nach dieser Richtung hin weiter entwickelt, wenn es sich tatsächlich fruchtbringend gestalten soll.

Von anderen Fürsorgeeinrichtungen sind vor allem noch die zuerst in Frankreich entstandenen Fürsorgestellen für Tuberkulöse zu nennen, die jetzt in Deutschland in grosser Zahl verbreitet sind. Das Wesen dieser Fürsorgestellen darf als bekannt vorausgesetzt werden. Sie stehen jetzt wohl in den meisten Städten unter städtischer Verwaltung und unterhalten einen innigen Connex mit den Krankenanstalten, eventuell Tuberkulosekrankenanstalten oder Tuberkuloseheimen, ferner mit sonstigen Wohlfahrtseinrichtungen wie Krippen, Waldschulen, und Walderholungsstätten, Ferienkolonien, Kinderheilstätten an der See, Soolbädern im Gebirge, u. Ä. m.

Da die Armenverwaltungen ein ausserordentlich grosses, zahlenmässig nachweisbares Interesse daran haben, die Trunksucht als eine der häufigsten Ursachen der Verarmung zu bekämpfen, haben entweder die Städte selbst durch Errichtung sogenannter Fürsorgestellen für Alkoholkranke die Bekämpfung des Alkoholismus in die Hand genommen oder unterstützen wenigstens diese Bestrebungen seitens besonderer Vereinigungen durch Zuwendung grösserer Beiträge.

Während die genannten Massnahmen die Aufgaben der Städte bei der Bekämpfung und Verhütung von Krankheiten betreffen, beschäftigt sich in der neuesten Zeit eine Reihe von Einrichtungen mit dem Ziele, die Gesundheit der Bevölkerung, namentlich die der heranwachsenden Jugend, zu steigern.

Von den Einrichtungen, auf diesem Gebiete, welche die deutschen Städte in Verwaltung genommen haben, seien hier vor allem die

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städtischen Bäder genannt. Schul- und Volks-Brausebäder, Flussbadeanstalten und grossartig angelegte Hallen-Schwimmbäder fördern bei niedrig bemessenen Preisen einerseits die Reinlichkeit, andererseits die körperliche Ausbildung.

Auch die Begünstigung der Leibesübungen und des Sports durch Turnhallen, durch Einrichtungen von Kinderspielplätzen, durch Eisbahnen für die Schuljugend, u. s. w. gehört, ebenso wie die Förderung der Jugendwanderungen, in den Bereich der Fürsorge für die körperliche Ausbildung der Gesunden.

In den am weitesten vorgeschrittenen Städten finden wir die Jugendfürsorge vom Säuglings- bis zum militärpflichtigen Alter des männlichen bezw. bis zum heiratsfähigen Alter des weiblichen Teiles der weniger bemittelten Bevölkerung entwickelt.

Endlich erfüllen die Städte noch eine unerlässliche Aufgabe auf dem Gebiete der Hygiene bezw. der Demographie durch die Sammlung und Verwertung der einschlägigen statistischen Ermittelungen. Wird doch so durch eine von verschiedenen Seiten beleuchtete Bevölkerungsstatistik ein wertvoller Prüfstein auf den Wert der zahlreichen Wohlfahrtseinrichtungen gewonnen.

Bei der Kürze der mir zur Verfügung stehenden Zeit konnte ich nur die wichtigsten Aufgaben skizzieren, welche die Selbstverwaltung der Städte übernommen hat und die sowohl auf dem rein ärztlichen wie auf dem hygienischen Gebiete liegen.

Zu ihrer Erledigung haben die Städte eine grössere Zahl von Ärzten in ihren Dienst gestellt und dieselben je nach ihrer Aufgabe bald dieser bald jener Verwaltungsdeputation unterstellt. Seither hat leider noch in den meisten deutschen Städten eine einheitliche Leitung auf dem Gebiet der Kommunalhygiene durch einen ärztlich und hygienisch geschulten Sachverständigen gefehlt. Es sind aber in dieser Beziehung bereits einige Städte wie Cöln, Charlottenburg, Schöneberg bei Berlin, u. a. durch Anstellung eines medizinischen Dezernenten und Einreihung in das Magistratskollegium vorangegangen und es steht zu erwarten, dass die übrigen Grossstädte diesem Beispiel bald folgen werden. Ist doch in den Städten die Mitarbeitung des ärztlichen Sachverständigen in der Zentralverwaltung der Städte genau so unentbehrlich wie diejenige des Ingenieurs und Architekten.

Ich darf zum Schlusse nochmals darauf hinweisen, dass in den deutschen Städten auf der einen Seite vom Staate angestellte Ärzte, sogenannte Kreisärzte bestehen, denen die von Staats wegen vorgeschriebene Überwachung aller gesundheitlichen Einrichtungen der Stadt obliegt, während auf der anderen Seite die städtischen Verwaltungen zur Einrichtung und Durchführung der ihnen obliegenden gesundheitlichen Aufgaben sich neben Ingenieuren und Architekten

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ebenfalls besonderer Ärzte bedienen, die bereits in einigen Grossstädten einer gemeinsamen ärztlichen Leitung unterstehen.

Und so sehen wir, dass die staatlichen Aufsichtsorgane nur eine Ergänzung der Selbstverwaltungskörper der Städte darstellen. Das von beiden Faktoren erstrebte Endziel ist aber ein durchaus gemeinsames, nämlich die Förderung der Volkswohlfahrt.

Dass dieses Ziel immer massgebend war und ist, beweist die z. T. geradezu glänzende Entwickelung der deutschen Grossstädte, die in einer steten Verringerung der Sterblichkeitsquote ihren zahlenmässigen Ausdruck gefunden hat.

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JOINT SESSION OF SECTIONS VI AND VII, TUESDAY MORNING, SEPTEMBER 24, 1912.

THE PUBLIC HEALTH SERVICE IN DENMARK—ITS ORGANIZATION AND ADMINISTRATION—THE MORE IMPORTANT LAWS AND REGULATIONS IN FORCE.

ANDERS JOHANSEN, Chief of the Office of the State Board of Health in Denmark.

I. The civil sanitory administration (with table).
II. The local (municipal) sanitary regulations and authorities.
III. Measures against infectious diseases.
IV. Measures against tuberculosis.
V. Some deficiencies of the sanitary administrative system.

PREFACE.

The following treatise aims to give a short schematic outline of the administrative system governing the public hygiene in Denmark, and also to give a more detailed account of the most important sanitary laws which now are in force, and which especially have contributed to the high standing of Denmark among the civilized nations with regard to the public hygiene. A short detailed account of all the enactments with regard to hygiene, the historical development, and the probable effect on the death rate of the country will be found in the treatise by Mr. J. Carlsen.

The regulations on which all Danish medical and sanitary measures are based are defined partly in laws concerning the whole Kingdom and partly in by-laws concerning only a single "commune" or jurisdiction, but fully binding for the inhabitants.[1] These by-laws are worked out and carried by the communal council (elected by popular vote), but must be ratified by the ministry of justice before acquiring legal power.

I. ADMINISTRATION.

The administration of the public health service, the enforcement of the specific regulations having legal power for the whole Kingdom, and the supervision that the laws are followed is the duty of the ordinary civil administrative authorities, but these are assisted by medical officers (embedslaeger) who are State officials, and by unsalaried boards (committees) appointed by the communal councils. The establishment of special superior supervising councils (salaried by the State) and the appointment of special inspectors has been

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made necessary by certain of the laws, such as the laws on the protection of workmen, compulsory accident insurance, State-subventioned medical aid societies, the regulation of factory work and inspection of the same, and by law on aid to the unemployed. To enforce the medical and sanitary by-laws and to see that the are obeyed is the duty of the local sanitary committees appointed by the communal councils. In boroughs the local chief of police (State official) is ex officio chairman of the board of health and the medical officer a member of the same.

Ministry of justice.—The supreme authority in the public health service is the ministry of justice, which is at the head not only of the department of justice but also of the police service. With the exception of the ministry of war, this is the only one having at its disposal special experts on medical and sanitary matters.

The military medical and sanitary service belongs under the ministry of war, the veterinary service under the ministry of agriculture, medical education and the education of pharmacists under the ministry for ecclesiastical and educational matters, under which likewise belong the "care of defective classes," imbeciles, deaf-mutes, and the blind. The common hospitals, excepting some few private ones, are communal institutions and therefore subordinate to the ministry of the interior—the supreme authority in all communal matters—and the same is the case with the State-subventioned medical aid societies, all poorhouses and almshouses. The State hospital (rigshospitalet) being an educational institution for medical practitioners, midwives, and sick nurses, and as such, in connection with the university, is subordinate to the ministry for ecclesiastical and educational matters, while the State insane asylums, the communal hospitals for infectious diseases, and all sanatoria for the tuberculous belong under the ministry of justice. On all matters concerning actual health conditions, the treatment of patients, matters concerning medical practitioners, midwives, etc., the other ministries, however, confer with the ministry of justice.

State board of health.—Ranking immediately under the ministry of justice is the State board of health (sundhedsstyrelse), which superintends all matters concerning sanitation and the care of patients, supervises the public medical officers and the medical practitioners, dental surgeons, apothecaries, midwives, and subordinate medical and pharmaceutical assistants in the performance of their professional duties, and all hospitals and sanatoria, all institutions under the poor laws, insane asylums, prisons, schools, nurse children, factories, workshops, etc., as to their sanitary conditions.

At the head of the State board of health is a chairman, who is a fully qualified medical practitioner (but on appointment must give up his private practice) and royal State official, appointed for life and having direct access to confer with the minister. As assistants he has two vice chairmen, appointed by the minister of justice for a limited number of years. One of these has to do solely with matters concern-

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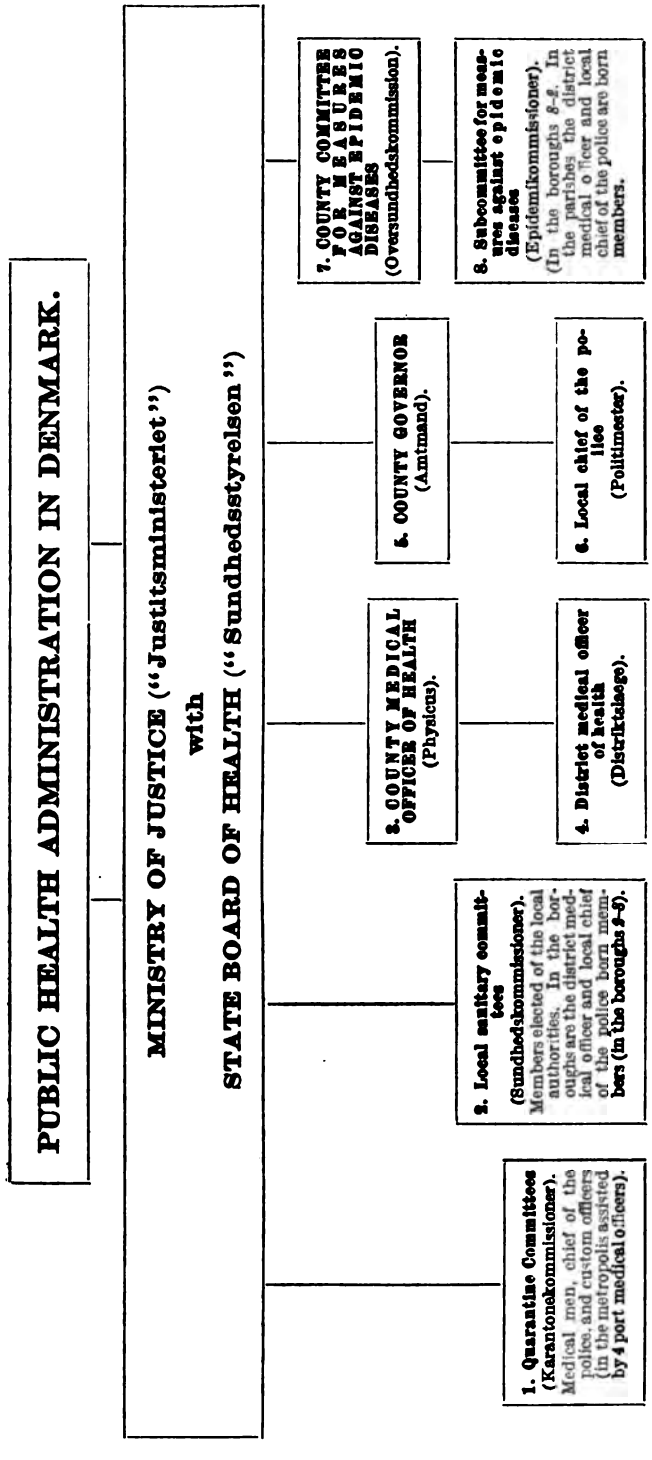
PUBLIC HEALTH ADMINISTRATION IN DENMARK.
MINISTRY OF JUSTICE ("Justitsministeriet")
with
STATE BOARD OF HEALTH ("Sundhedsstyrelsen")
1. Quarantine Committees (Karantænekommissioner). Medical men, chief of the police, and custom officers (in the metropolis assisted by 4 port medical officers).
2. Local sanitary committees (Sundhedskommissioner). Members elected of the local authorities. In the boroughs are the district medical officer and local chief of the police born members (in the boroughs 3-6).
3. COUNTY MEDICAL OFFICER OF HEALTH (Physicus).
4. District medical officer of health (Distriktslæge).
5. COUNTY GOVERNOR (Amtmand).
6. Local chief of the police (Politimester).
7. COUNTY COMMITTEE FOR MEASURES AGAINST EPIDEMIC DISEASES (Oversundhedskommission).
8. Subcommittee for measures against epidemic diseases (Epidemikommissioner). (In the boroughs 3-6. In the parishes the district medical officer and local chief of the police are born members.

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ing pharmacy. Further there are attached to the State board of health a number of specialists in medical, surgical, and pharmaceutical matters, and a dental surgeon. These are called "consulents" and are appointed by the ministry of justice on the recommendation of the State board of health. Each matter is treated not by the State board of health collectively but by three members, the chairman, either the medical or the pharmaceutical vice chairman, as the case may be, and that consulent who is a specialist in the matter in question. These three members form a council which has to do with all matters and supervises all conditions embraced by the speciality of the consulent.

In all matters requiring medical or pharmaceutical knowledge the State board of health is the highest advisory authority for the various ministries and other departments of the central administration, and to it must be submitted all matters of importance for the public health service or for the subordinate medical and pharmaceutical assistants, midwives, etc.; that is to say, all proposals for new laws and by-laws, all plans for hospitals, insane asylums, other sanatoria, and institutions under the poor laws, as well as the regulations for them. This board receives all applications for appointments as public medical officers (State officials) and all applications for apothecaries' licenses (only a limited and rarely increased number of which are available in Denmark), and it recommends which applicants are to be preferred. It proposes the establishment of new "apotheks," [2] has the supervision of the moving of already established ones, and it annually fixes the price of drugs. Further the State board of health has to survey the enforcement of medical and sanitary laws and regulations generally, correct and advise the public medical officers in the performance of their professional duties, call the attention of the civil authorities to transgressions of the medical and sanitary laws, and if necessary make suggestions to improve the conditions. A further duty is to spread hygienic information amongst the population.

The board receives reports on diseases prevailing, and on sanitary conditions, from the public medical officers, hospital practitioners, and the general practitioners, and treats these reports comprehensively in a special medical statistical bureau of its own, giving a synopsis of diseases prevailing in the country, of the causes of death, the birth rate, and information on the work done by hospitals, practitioners, dental surgeons, and midwives. It reprimands members of the medical profession when they show negligence or misbehavior, or recommends the ministry to issue a reprimand. Finally, it is the highest authority for superintending all measures against the introduction and spread of infectious diseases.

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The State board of health can personally, either through its chairman or one of its members, inspect the institutions under its authority and can itself direct the measures to be taken, but, as a rule, the necessary measures are enforced and the personal inspection is done by the local medical officers, who then report to the board. The leading principle has been to place the executive authority as far as possible in the hands of the local medical officers, so that the State board of health under normal conditions is largely the guiding and advisory authority for the independently working medical officers, and only acts directly under extraordinary conditions (especially serious epidemics).

Superior local authorities.—The superior civil officer of an "Amt" or county (average population 100,000) is the "Amtmand" or governor of a county, who is chairman of the "Amtsraad" or county council (elected by popular vote), but he is also a State official with superior administrative authority. He is the head of the county's public health service, and is assisted by a superintending medical officer, the "Physicus," who is his and the county council's expert adviser in all things concerning the public health service and the members of the medical profession. The governor of the county and the superintending medical officer, together with three lay members elected by the county council, form a county committee for measures against infectious epidemic diseases, which measures are carried out by the county's subordinate local committees against epidemic diseases. The county council is considered the authority for granting expenses.

Besides being the county governor's adviser and a member of the superintending board of health, the "Physicus" is the connecting link between the State board of health and the medical officials of his district (Physicat), whose public work he supervises.

He supervises hospitals and "Apotheks," prisons, schools, workhouses, and almshouses with regard to their sanitary condition. He gives instructive lectures for midwives, reports on applicants for the position as midwife, and controls that they conform to the regulations given them regarding prophylactic measures. His duty is to generally acquaint himself with and to supervise the hygienic conditions in which the population lives and to endeavor to improve them, and he also strives with all practical means to abolish such customs and ideas amongst the population as form obstacles to an improvement of their state of health. Should the place of a medical officer become vacant, he has to see to it that the professional duties in connection therewith are attended to responsibly until a new medical officer is appointed. Should it come to his knowledge that the paupers anywhere in his province have difficulty in securing medical aid, he must try to have this changed for the better.

In urgently pressing cases the "Physicus" can have measures carried out without first consulting the governor of the county or the

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State board of health, but he must then immediately report on the measures taken.

He performs the autopsies at coroners' inquests together with the district medical officer concerned, who himself carries out all other medico-legal examinations in his own district.

The "Physicus" receives the returns and reports which the medical practitioners and district medical officers of his province are required to send him; he sees to it that these reports are made in due time and form; he collects and epitomizes this material; and based thereon, as well as on his own experiences he annually renders a report to the State board of health.

Beyond his duties of supervising measures against infectious diseases, in his quality as member of the county committee for measures against infectious epidemic diseases, the "Physicus" has a further, independent duty. As soon as he receives an official report or otherwise hears that a serious epidemic disease has appeared within his province—Asiatic cholera, smallpox, dysentery, etc., or a suspicious case—he must immediately appear on the spot and see that all necessary measures are taken for the isolation and treatment of the patients.

In general his sphere of activity embraces two "Amter," or counties, so that he is a member of two county committees for measures against infectious epidemic diseases and the adviser of two "Amtmänd" or governors of counties.

Together with the local chief of police and the highest ranking official of the customs in the seaport where he resides the "Physicus" forms a quarantine committee which inspects ships arriving from abroad.

Subordinate local authorities.—The direct executive authority is in the hands of the local chief of police, who is a State official. In rural jurisdictions and in the smaller boroughs, besides being chief of police for the jurisdiction, he is also judge, and in the boroughs frequently also burgomaster—i. e., chairman of the communal council, which is elected by popular vote. In the larger boroughs, however, the office of burgomaster is an independent one, and in the capital (Copenhagen) the chief of police has nothing to do with the duties of a judge. The district of a local chief of police embraces a population of 5,000 to 15,000, in the larger provincial towns up to 70,000.

In cooperation with the local chief of police is a district medical officer—a State official—as his expert adviser in all sanitary matters and as medicolegal officer for the jurisdiction.

The local chief of police is chairman of the subcommittee for measures against epidemic diseases, which includes also the district medical officer and three or more lay members elected by the town council or the county council, or both. In the boroughs these com-

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mittees for measures against epidemic diseases are generally identical with the ordinary local sanitary committees, of which more will be said. The subcommittee for measures against epidemic diseases has to carry out all measures necessary to prevent the spread of infectious diseases; in urgent cases the chief of police and the district medical officer can carry out provisional measures, but must, as a rule, call together the whole committee if measures of far-reaching importance are to be taken. The committee can give any one of its members temporary or more prolonged authority to survey the enforcement of certain regulations and to supervise matters within certain limits; thus the district medical officer frequently receives general authority to have disinfection carried out at public expense. The specific duties of the subcommittee for measures against epidemic diseases are the following: To order "public compulsory treatment" of cases of epidemic diseases (such resolutions must, however, be sanctioned by the county committee); to provide suitable localities for the patients suffering from the diseases which are subject to "public compulsory treatment"; to provide the necessary medical attendance and material for the treatment of the sick and to appoint an "epidemic doctor" for the treatment of the patients; to order and enforce disinfection; to see that the law for compulsory notification of cases of the more serious epidemic diseases is followed, and that all persons who have been in contact with the patients follow the regulations given them to prevent the spread of infection.

Further, the committee receives notification of deaths from pulmonary or laryngeal tuberculosis; in certain cases it orders compulsory admittance to hospital of patients suffering from tuberculosis; it arranges for disinfection at public expense after deaths from tuberculosis and also for disinfection after deaths, admittance to hospital, or after recovery from the more common epidemic diseases which are not necessarily treated at the public expense.

The district medical officer acts, of course, in many cases, as already indicated, as proxy for the whole subcommittee or for the chairman, but is responsible to the committee, and it is he who, under normal conditions, makes arrangements and supervises their being (carried out) id est: supervises the carrying out of the arrangements. As a rule, he is appointed "epidemic doctor"; that is to say, he is intrusted with the public compulsory treatment when an epidemic disease is handled in that way.

Apart from and independent of his duties as member of the subcommittee for measures against epidemic diseases, the district medical officer, as a State official, has the supervision of all public sanitary matters in his district; he has to enforce the laws and regulations, to reprimand trespasses and negligence, or in any case to draw the attention of the respective authorities to them.

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He also supervises the professional activity of medical practitioners in his district in so far as this concerns public interests; he receives notifications and reports from them, and from the church officials he receives reports of births and deaths. He is the immediate superior of the midwives, controls their professional practice, prescribes the cleansing and disinfecting regulations to be followed in case of infectious disease among the women whom they attend or the women's new born.

The district medical officer is empowered to inspect the "Apotheks" and dispensers of drugs and to inspect prisons, nurse homes, workhouses, and almshouses with reference to their sanitary conditions; he must acquaint himself with all conditions in his district which are of importance for the public health, and in every practicable way must influence the civil or communal authorities in the direction of sanitary progress.

The district medical officer performs public vaccination; he is a member of the quarantine board at the seaport where he resides; and finally he has to attend to all sick paupers in the district, and has in general the obligation to give medical assistance to all who apply, of course with right to claim a fee from those who are not paupers.

II. COMMUNAL BY-LAWS AND AUTHORITIES.

Many of the rules and regulations governing the sanitary affairs of the country are defined in the so-called sanitary by-laws. These are elaborated by the representatives (elected by popular vote) of each "commune" or jurisdiction, assisted by the district medical officer or other medical expert. After being drafted by this council, the by-laws are sent to the ministry of justice for confirmation. Before this is done both the respective medical officers, local chief of police, governor of the county, and finally the State board of health are afforded the opportunity to propose alterations. If amendments are proposed, the matter is referred back to the communal council, which accepts or rejects the amendments. No authority can force the communal council to accept undesired regulations, and the by-law which is confirmed by the ministry of justice therefore expresses the communal council's own wishes. But the ministry of justice can refuse to confirm a by-law which is considered inadequate or which contains regulations that appear to be encroachments. As the size of the communes varies from the capital's commune, embracing 420,000 inhabitants, down to the rural parish communes with 500 inhabitants, the extent and the contents of the sanitary by-laws naturally differ very much. There still exist rural parish communes with so sparse a population, so little influenced by modern industrial development and so far removed from modern methods

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of communication, that they have not found it necessary to provide sanitary by-laws. In case a commune develops in such a way that a sanitary by-law is considered necessary, and if the commune does not take the initiative, then the governor of the county and the ministry can urgently request the communal council to come forward with a proposal.

As regards the contents of the by-laws, it is only possible to give general indications. The regulations aim to prevent pollution of air and soil, to provide for the supply of drinking water, the arrangement of wells and water conduits, the removal of refuse, the arrangement of sewers, privy pits, closets, manure heaps, and other refuse, and their distance from drinking wells and habitations, regulations for stables, pigsties, and other shelter for animals, the quality of building sites and of buildings to be erected thereon, for apartments to be rented out, servants' chambers, inns and lodging houses, offensive trades, and objectionable smoke nuisance, for factories, workshops, places of the production and sale of provisions, as bakeries, slaughterhouses, dairies, for meat inspection (in many places the by-laws prescribe compulsory trichina examination), for the inspection of milk supplied to the public, for the equipment and cleansing of schools, asylums, nursing homes, poorhouses, hospitals (even of private hospitals), of burial grounds, etc.

The sanitary by-laws of the boroughs are in some cases whole volumes; those of the rural parishes have only a few divisions aimed at very flagrant offenses against hygiene. There are, however, rural communes which have a consistent inspection of meat and of milk, besides many other excellent regulations.

To enforce these by-laws is the duty of a local sanitary committee (Sundhedskommission) chosen by the communal council (elected by popular vote). In the country parishes the board consists of three to five members. In the boroughs, the State officials, i. e., the local chief of police and the district medical officer, are practically always members of this board, the chief of police being the chairman; in the boroughs they are accordingly identical with the subcommittee for measures against epidemic diseases (Epidemikommission). In the larger boroughs the local boards of health are assisted by civil engineers and other experts in the service of the commune. In the capital the Copenhagen Board of Health has, besides the city medical officer (Stadslaegen), who is a State official, at its disposal a number of salaried medical officers, specialists in hygiene, further a veterinary surgeon, its own laboratory, and in the daily work the assistance of members of the police force. In the country parishes the local chief of police and the district medical officer have the right to be present at the meetings of the various parochial boards of health,

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but without votes or executive authority. They have, however, in a general way, the duty to see that the regulations of the by-laws are followed and to draw the board's attention to trespasses and to negligence. In cases of trespass, the means of compulsion provided for by the common laws, such as fines, daily fines, etc., can be put in action by a judicial decision.

It is scarcely possible for a foreigner to understand fully the important influence exercised on the public health of the country by this system of legislating, expense granting, supervising, and executing authorities. It has worked and still works so effectively that Denmark, as regards hygiene, can be placed high among the nations of the world, and, as regards the fight against infectious diseases, possibly ranks among the very first. The cause of this is scarcely the administrative system itself, although the principle of local self-government, as expressed in the communal sanitary by-laws, should not be undervalued, because, by reason of this principle, the regulations do not appear in the light of autocratically imposed measures, but rather as self-imposed regulatives, called into being by intelligent understanding of their expediency. The chief cause for this fortunate result is in all probability the form and the contents of these regulations and the fact that the population as a whole is very well informed, accustomed to them, and, from an economic point of view, ambitious that Denmark should gain the reputation of being a clean and healthy country.

Denmark's agriculture is dependent on the exportation of provisions of animal origin in the form of butter, meat, eggs, and live cattle to its large neighbors (Great Britain and Germany). This has induced the agricultural part of the population to become interested collaborators in the work of the veterinary health service (Veterinærsundhedsvaesen) to improve the general health of the cattle, and especially to exterminate cattle tuberculosis. Some 30 to 40 years ago, Danish agriculture changed from a corn-producing basis to the production of milk. This gave the farmers an early and quite comprehensive understanding of the importance of microorganisms, and thus helped them to understand and to assist the medical profession's fight against epidemic and bacterial diseases.

For example, the epidemic law (epidemiloven) does not categorically prohibit the supply of milk to collecting dairies from properties where there are cases of typhoid fever, scarlatina, or diphtheria; nevertheless, the boards of many dairies, elected by the milk suppliers, have ruled that the dairies must not receive milk from infected properties. If a commune's sanitary by-laws contains no regulations regarding clean stables or concerning the health of farm hands and of cattle, the dairy will include in its standing rules such regulations as will force the milk suppliers to take suitable measures. The

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requirements of the dairies have in many places stimulated the demand for a better supply of drinking water, and the dairies' bathing installations for employees have caused the population to seek improved facilities for personal cleanliness.

Other circumstances have led the people to understand and take part in the work of the authorities for the promotion of hygiene. Our medical aid societies (Sygekassér) which, with the assistance of State and communal funds, assure all the less well-to-do inhabitants of the land easy and cheap access to medical aid and hospital treatment, and which embraces nearly three-fourths of the population, has brought large numbers into close contact with the medical profession and medical views, and so imparted valuable information. Further, the influence of this medical aid institution works toward the admission of practically all cases of infectious disease into hospitals for infectious diseases and gives all patients access to early and rational treatment, partly in their homes and partly in the numerous well-arranged and well-conducted communal hospitals. Our law for old-age pensions has had a similar influence, for it saves people from having to pass their old age among bad hygienic conditions, and in many boroughs, as also in some country parishes, enables them to pass their last years in well-lighted, clean, and wholesome asylums, where their comfort is considered in every way. This again influences the country's sanitary condition in a beneficial way, and a similar influence is exercised by our laws for the relief of paupers.

The laws on factory hygiene and on various branches of industry, together with the regulations in connection therewith, all largely inspired by the working classes, have greatly contributed to improve the sanitary conditions for the working classes in their work time, and have educated them to require better hygiene in their homes and in their persons. The laws on compulsory accident insurance for workmen in certain industries, and on societies for mutual aid to the unemployed, which are subventioned by the State and the commune, directly help to raise the social status of the working classes.

The regulations in force for the arrangement and supervision of schools, the laws for the inspection of nurse children, the State subvention for the education of sick nurses in rural parishes, the whole work for the care and the instruction of the deaf mutes, the blind, and imbeciles, all help, both directly and indirectly, toward improving popular hygiene and the enlightening of the population.

The laws on public inspection of provisions, on sanitary conditions at places of food production, the communal control of milk and meat on sale to the public, aim directly at hygiene and teach the people to be cleanly in their private production of food for their own use.

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The requirement that the sale of drugs for medical purposes must in general only take place from regularly inspected "apotheks," under a special personal license (privileg), at prices fixed annually by the State board of health (sundhedsstyrelsen), which "apotheks" are carried on by "apothekere" who have passed a special pharmaceutical examination and received a license—these regulations insure the people easy access to good and reasonably cheap medicine and do much to prevent them falling into the hands of quacks and makers of nostrums.

The regulations that the treatment of the sick is only permitted to fully qualified practitioners (whose education takes seven years, and as a rule is supplemented by two years' practical hospital work after the examination), dental surgeons and midwives who have passed a State examination, in our own opinion constitute one of the most important means for creating and preserving good public health.

The private members of the medical profession, especially the medical practitioners and the midwives, must not be forgotten when speaking of the organization of Denmark's public health service and the administration of hygienic measures.

Physicians must, without any recompense, notify their district medical officer of all cases of infectious disease occurring in their practice; serious cases at once and singly, stating name and address of the patient; cases of less serious endemic disease each week, and only in part with addresses; they must notify deaths from tuberculosis, and in general have to supply material for statistics on sickness. If they practice outside of the capital they have to send in annual reports on medical and sanitary matters within the sphere of their practice. They also have the duty of organizing the first and urgent measures against the spread of infection, and must keep venereal patients under treatment until fully cured. Although private practitioners have no express duty in this respect, it is a general rule that the private practitioner, after cases of infectious diseases, proposes disinfection at the public expense. In many rural parishes the committee for measures against epidemic diseases gives the private practitioners general authority to carry out disinfection at the public expense, the committee being responsible. As every Danish medical man has a chance of in time being appointed a public medical officer, and as there exists no special course of training for medical officers, only a short course for them after appointment, many private practitioners eagerly endeavor to thoroughly acquaint themselves with everything concerning the public health service; they enlighten the population in their daily work by lectures and dissertations in the newspapers, whose interest for these matters is remarkable.

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Midwives, even those practicing quite privately, must keep registers of the births at which they assist, of the course the birth takes, of the sex and degree of development of the child, and they must notify stillbirths. They must likewise report cases of fever of the lying-in women, of tetanus, pemphigus or ophthalmoblenorrhea of the new born, and they must subject themselves to disinfecting measures and refrain from practicing when so advised by the medical officers in consequence of such sickness. During the whole of their activity they must observe the rules for cleansing and disinfecting to prevent febris puerperalis (puerperal fever), regarding which they are instructed, and they must instill nitrate of silver solution into the eyes of new-born infants immediately after birth. This last regulation is undoubtedly of great importance. Ophthalmoblenorrhea of children is in Denmark an extremely rare disease.

When trying to give in the following an idea of the contents of some of Denmark's hygienic laws, it will be natural to select the laws which are most characteristic for Denmark, i. e., the laws whose aim is to prevent the occurrence and spread of infectious epidemic diseases. The characteristic feature of these laws is that the chief part of the expenses is defrayed from public funds—the State treasury and the communal treasury.

III. MEASURES AGAINST SPREAD OF INFECTIOUS DISEASES.

In the first place comes the law on measures against the spread of infectious diseases, with reference to which all cases of the more serious epidemic diseases, without regard to whether the patients are rich or poor, can be treated at the public expense. This concerns cholera, the plague, exanthematous typhus, dysentery, yellow fever, smallpox, typhoid fever, scarlet fever, diphtheria, cerebrospinal meningitis, poliomyelitis anterior acuta, and leprosy. This law requires the provision of isolated buildings in all seaports, where cases of the more serious epidemic diseases—cholera, plague, etc.—can be admitted and treated, and requires the erection in the boroughs, as well as in the country, of hospitals destined solely for the more common infectious diseases.

Compulsory public treatment.—Cases of the rarer and more serious diseases—cholera, plague, smallpox, dysentery, and exanthematous typhus—are at once submitted to compulsory public treatment; that is to say, the patient is at once treated at public expense, and he, as well as his surroundings, must submit to the isolation and disinfection which the committee prescribes and carries out. During compulsory public treatment everyone is compelled to notify the "epidemic doctor" (Epidemilaegen) of any suspicious case of illness arising in his household, and the private medical practitioners are obliged to imme-

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diately notify the district medical officer of each case of the diseases mentioned above, giving the name and address of the patient. The patients can be treated in their homes, which must then be isolated, but most frequently they are admitted to the isolation buildings. Persons who have come into contact with the patients are isolated and placed under observation, and they may be forbidden to continue their trade if this is considered necessary. It is forbidden to use public conveyances for moving patients; meetings and public amusements can be suspended; school children from an infected household are not allowed to attend school; the supplying of milk from the property is forbidden; and the necessary disinfection of dwellings, clothes, household furniture, and bedclothes is effected. The public funds defray all expenses for the treatment of the patients, pay an indemnification for the trade losses incurred as a consequence of the measures prescribed, and likewise compensate for the personal effects destroyed or damaged in course of disinfection.

The other, more endemic diseases, as typhoid fever, diphtheria, scarlet fever, and epidemic cerebrospinal meningitis, are not at once taken under public compulsory treatment in a similar manner. As regards these diseases, it is in a certain degree left to those concerned to decide how they wish to have the patient treated, and there is no obstacle to families having members of their household treated at home by private practitioners. In such a case the carrying out of isolating measures is largely left to the judgment and good will of the family and its doctor; it is, however, always forbidden to let children from infected homes go to school, until they can present a satisfactory certificate from a medical man stating that they are not carriers of infection. Likewise, the subcommittee for measures against epidemic diseases can forbid the removal of milk and other dairy products from the property if the inmates have had to do with the handling of the milk, and it can order disinfection at the public expense when the disease is at an end. It should be remarked that it is incumbent on the physician treating the case to report to the district medical officer all cases of epidemic diseases which he has taken under treatment in the course of the week, giving the addresses of patients suffering from typhoid fever, diphtheria, etc. The district medical officer is thus able to keep track of a beginning local epidemic of these diseases, and to see whether they are likely to spread. He can warn the committee of a threatening epidemic and induce it to intervene, and he is also empowered by personal inspection to ascertain whether suitable measures are being taken.

The circumstance that the law does not prescribe compulsory public treatment of these more domestic epidemic diseases is based on a certain fear of encroaching too far on personal freedom, but as this might possibly permit the spread of these diseases, the law also offers

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to treat them at the public expense, but under a somewhat different form than the so-called compulsory public treatment (offentlige Behandling). The law offers gratuitous treatment (vederlagsfri Behandling); that is to say, the patients, immediately the disease is diagnosed, can be admitted for free treatment to the communal hospitals without regard to their means. All expenses for the patients' stay, board, and treatment at the communal isolation hospitals (Epidemihuse), destined solely for the more common infectious diseases, are defrayed by public funds, the state treasury paying three-fourths and the respective communal treasuries one-fourth. After admission of the patients to the hospitals their homes are disinfected at the public expense.

This provision of the law has made necessary the erection of numerous isolation hospitals, which in most cases are divided into three or more wards, and the result has been that by far the greater number of cases of the diseases specified apply for and are admitted to gratuitous treatment. By far the majority of the population has learned that admittance to the hospital saves the homes from great economic loss and inconvenience. After the patients are admitted to the hospital and the homes are disinfected the families can again move unrestricted among their fellow citizens, the children can attend school, and the adults can, without restraint, continue their trades. In case an obstinate family should refuse to have its patients sent to the hospital, the neighbors would feel indignant, the dairies would refuse to receive milk from them, the schools would refuse to allow their children to attend, and all this would teach them that it would be to their advantage to act differently the next time.

Finally, the law provides that the subcommittee for measures against epidemic diseases can, with the consent of the county committee for measures against infectious epidemic diseases (Oversundhedskommission), resolve "compulsory public treatment," also of these diseases if they occur with a greater frequency or in a more virulent form.

The working of this law, first enacted in 1888, later on revised, and in 1900 considerably extended, has been very beneficent. The more endemic diseases have decreased yearly in frequency, and smallpox occurs only now and then, not even every year; typhoid fever has become a very rare disease.

However, the decreasing frequency of these diseases is not due to this law alone, but also to other conditions. Thus, intermittent fever has been a practically unknown disease for the last 30 years, probably because arable land is drained, swamps reclaimed, and watercourses regulated, so that everywhere free outlet has been opened for water.

Vaccination.—The frequency of smallpox has been decreasing greatly throughout the whole country. The present law requires that

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all children must be vaccinated before the age of 7. Vaccination is performed at the public expense by the district medical officer, unless a certificate is presented from a private medical practitioner attesting to successful vaccination. A certificate of vaccination must be produced before any child can be admitted to school, and school attendance is compulsory. The people willingly allow their children to be vaccinated, and this is generally done about the third year of age. Humanized vaccine is sometimes used, taken by the medical man from those he has himself vaccinated, or else—and this is the more general custom—animal vaccine, cultivated at the "Vaccineinstitut" of the State. Besides general compulsory vaccination of children, it is the custom to decree public vaccination for the inhabitants of a district as soon as a certain number of smallpox cases has occurred. Such public vaccinations are availed of voluntarily by the great majority of the adult population for revaccination and by the not previously vaccinated children.

The establishment by the State of a "Serum-Institut," where diphtheria serum is produced and placed at the disposal of medical men and hospitals without other charge than the forwarding expenses, has been of great importance in the fight against diphtheria. Practically all cases of diphtheria are treated with serum, and it is also used as a preventive. The opening of diphtheria-diagnosing stations at the larger hospitals, where examinations are performed free of charge, and the free examinations at the "Serum-Institut" for the Widal typhoid test and the examination of blood and feces for typhoid bacilli, have also promoted the aim of the law. Emphasis is put upon the tracing of "typhoid carriers," and it is a general rule that convalescents are not let out of hospitals before an examination of feces and urine has shown absence of typhoid bacilli.

The epidemic law includes a regulation for the carrying out of disinfection and a regulation for the disposal of the bodies of persons who have died of infectious diseases.

Lastly, the personal cleanliness and hygienic understanding of the people have increased since the law has been in force, partly as a direct result of the law and partly because our farmers are now engaged principally in exporting first-class provisions of animal origin. The decrease of typhoid fever can be largely attributed to the large cooperative dairies, which require clean and wholesome milk and also a good drinking water on the properties producing the milk. Skim milk and whey must not be delivered from these dairies or returned to the suppliers without being pasteurized. The younger generations have had great influence in hygienic matters, owing to the education gained from the elementary schools, high schools, agricultural schools, from literature and the press, and from taking part in public life.

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Quarantine.—Our country's favorable position as regards frequency of epidemic diseases would, of course, be difficult to maintain if we did not have laws and authorities to oppose the importation of infectious diseases from abroad. The older laws of this kind have, with slight alterations, been worked together to an "act of April 12, 1911, on measures against the introduction of epidemic diseases into the Kingdom." This law fully conforms to the international regulations contained in the international convention which Denmark has joined.

In every seaport there is a quarantine committee (Karantainekommission) consisting of the local chief of police and the highest ranking custom and medical officers, who have the supervision of the ships arriving from abroad and whose duty it is to take the necessary measures toward ships infected or suspected of infection. The medical officer or the master of every ship arriving from abroad must give the board's representative a declaration in writing of the ship's sanitary condition before the ship can have intercourse with the shore. Should there be suspicious circumstances, or if the ship comes from a port infected with cholera or the plague, the ship, crew, and passengers must be subjected to medical inspection before the ship receives permission to moor to the quay. Should this inspection reveal nothing suspicious, the ship receives written permission of free intercourse with the shore (Samkvemspas=pratique) and may then moor to the quay. Should there be patients on board, they are brought ashore to the special isolation building and the ship is disinfected. The rats are exterminated, if necessary, and in some cases the crew and passengers can be isolated on board or placed under observation for a certain number of days. Passengers who leave an infected or suspected ship must submit to a daily medical inspection, no matter to what part of the Kingdom they travel, their route being telegraphed to the authorities of each place where they make a stay. The patients brought ashore for treatment and isolation, etc., and those of the crew and passengers who are under observation ashore, are under the control of the subcommittee for measures against epidemic diseases, and the duties of the quarantine board are therefore confined to the ship and those on board.

All this conforms in general to the international regulations, but it is worthy of special notice that Denmark is able to receive and, with only slight delay, treat any ship, no matter what disease it is infected with. This is owing to the fact that every Danish seaport borough is provided with a fully equipped isolation house (isolationshus) for patients who suffer from the more serious epidemic diseases as cholera, the plague, smallpox, etc., and that it has all necessary material and assistants for nursing and disinfecting.

The expenses for the treatment of cholera, plague, etc., cases coming from the sea, for the disinfection and supervision of the ships,

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the extermination of the rats carrying infection, and so forth, are defrayed by the State treasury in all cases where the destination of the ship is a Danish port. Ships, however, which only call in order to put their sick ashore and to be disinfected must pay the expenses.

In spite of the Kingdom's nearly daily communication by sea with Russian ports, which have often been cholera infected during recent years, in 1908–1911 only 2 cases of cholera were imported. These cases, which were brought ashore and treated at the isolation houses, did not infect any citizen of the Kingdom. A contributory cause for this good result has probably been the circumstance that the ministry for commerce and navigation has distributed among all Danish vessels visiting infected ports a set of instructions elaborated by the State board of health (Sundhedsstyrelsen) giving the measures to be observed by the vessel and the crew to avoid bringing infection on board.

At the frontier toward central Europe there is a staff and material which can immediately be brought into action should danger arise of cholera being imported from our southern neighbor; such danger, however, is very slight in view of that country's excellent public-health service. The State railways have instructions for the staff which enable it to deal promptly and correctly with any case which may occur.

It will have been noticed that such diseases as measles, whooping cough, and the chronic, infectious skin diseases have not been spoken of. The measures against these diseases are usually left to private initiative, but under extraordinary conditions our legislation allows the individual commune, with the sanction of the ministry of justice, to decide that also these diseases can be treated at the public expense. The idea has been partly that these diseases are less dangerous to society, partly that they can not easily be limited by isolating and disinfecting measures, but nevertheless influential men have proposed that also these diseases be provided for in the law now undergoing revision and to be enacted in the near future.

Venereal diseases.—The fight against the infectious venereal diseases is conducted in conformity with a special act of 1906. The principal regulation of this law is that every case of infectious venereal disease is, on the application of the patient, entitled to free treatment at public expense, regardless of whether the patient is rich or poor or whether the case can be treated as an out-patient or must be admitted to a hospital; and, on the other hand, every patient seeking the aid of a medical man, whether he accepts free treatment at public expense or has himself treated privately, is enjoined to continue the treatment under direction of a medical practitioner or at a hospital until he can be declared cured. Therefore, even if a patient has recourse to a private practitioner, he is obliged to follow

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his advice with regard to measures against the spread of infection and as regards appearing for examination at stated periods; likewise, if the patient does not appear as enjoined or presents a certificate that another practitioner has taken over the treatment, the medical man who first treated him must notify his nonappearance, his name and address, and the nature of his disease to the public medical officer, who then enjoins the patient to appear before him. To ignore this injunction makes the patient liable to a fine, and the statement of a wrong name and address likewise is punishable. If the patient's condition is such that the propagation of the disease to other persons can not be satisfactorily insured against, or if he does not live according to the injunctions communicated to him, he may be removed to a hospital. In case the patient refuses to enter the hospital, the matter is decided by the governor of the county (amtmand) or the minister of justice, and the assistance of the police can be resorted to. Patients receiving regular aid under the poor laws must always be sent to the hospital. The diagnosis of syphilis and criticism of the results arrived at by treatment are assisted by the "Serum-Institut" of the State undertaking, for a moderate charge and sometimes even gratuitiously, examinations (Wassermann) on application from the medical man treating the case.

To propagate venereal disease is punishable, according to the criminal code, if the offender at the time of infecting was conscious of the nature of his disease. Of married people, the one consort can even demand the punishment of the other. It is forbidden that a syphilitic child be breast fed by another woman than its own mother, and syphilitic women who undertake to suckle the children of other women are punishable, according to the criminal code.

Persons offending against those regulations which seek to combat immorality can be enjoined to appear before the public medical officer for examination at regular intervals.

What results the regulations of this law have had or will have it is not yet possible to state; for they have been confused by the fact that, simultaneously with the enactment of this law, the former regulations for the police supervision of prostitute women were repealed, doing away also with the medical examination of prostitutes known to the police. One rather unpleasant consequence the law seems to have had: Patients from other countries, especially seamen, come to Denmark to secure gratuitous treatment.

IV. MEASURES AGAINST TUBERCULOSIS.

Tuberculosis is being fought against in a rational, steady, and successful manner. Possibly the consideration that Denmark's important stock of cattle and swine must be kept as free as possible from

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tuberculosis may explain Denmark's first-rank position in the fight against tuberculosis. At any rate, the legal regulations against tuberculosis among cattle and swine were the first measures taken by the State in the fight against tuberculosis. The State offers free tuberculin examinations of cattle, offers compensation for the slaughter of cows afflicted with tuberculosis of the udder, and forbids the return of skim milk and whey from the cooperative dairies unless pasteurized.

These circumstances alone can not, however, explain the great general sympathy which the fight against tuberculosis has won from the population.

This sympathy is in a far higher degree the expression of an understanding of the importance of hygienic measures for the welfare of society, an understanding present among all social classes and which the sanitary laws have frequently helped to awaken.

The initiative for an energetic and systematic fight against human tuberculosis was taken by the General Society of Danish Medical Men (Den almindelige danske Laegeforening), of which practically all Danish physicians and surgeons are members. By the subscription of shares among its members a fund was created which made possible the erection of the first tuberculosis sanatorium in Denmark, at Vejlefjord, in 1900, the State assisting by means of a loan without interest. Beyond this, the society defrayed the expense of printing and circulating pamphlets giving popular information about tuberculosis, and posters giving the most important prophylactic measures. Very shortly after, in 1901, a great association was formed, recruiting its members from among all social classes of the population. The National Association for Fighting Against Tuberculous Diseases, which, by means of an energetic agitation, came into the possession of large funds, contributed voluntarily, and began to build sanatoriums for the people. The strong popular feeling thus proved to be present induced the legislative authorities to take the matter up, and the result was our two laws on tuberculosis, which were enacted in 1905, and now in 1912 are drawn up in a clearer revised form. One of these prescribes in general the measures to be taken against tuberculosis, the other defines the rules for granting State subvention for the establishment of hospitals and nursing homes and for the treatment of tuberculosis at these institutions.

The first law makes it the duty of the above-mentioned committees for measures against epidemic diseases (Epidemikommissioner) and of the county committee for measures against inf. epid. d. (Oversundhedskommissioner) to conduct the local measures against the spread of tuberculosis. It is the duty of physicians to notify the medical member of the Epidemikommission, i. e., the district medical officer, of every case of tuberculosis of the lungs or the larynx coming under

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treatment, likewise every case of death from tuberculosis, for which they have drawn up a certificate of death. The Epidemikommission arranges for disinfection at public expense of the dwelling, clothes, and bedclothes after deaths from tuberculosis, or of the dwelling when the patient moves or is admitted to a hospital. Clothes, bedclothes, and personal linen, when previously used by sufferers from tuberculosis, must not be sold or otherwise disposed of to other persons for their use without having first been disinfected. Tuberculous women must not act in the capacity of wet nurses, tuberculous families must not take children to board, and tuberculous children must not be placed out to board in private families; when arranging for placing children out to board both parties must therefore produce medical certificates. Tuberculous children are not allowed to attend school together with healthy children, but suitable instruction must be provided at public expense. All public and private schools must be kept clean in accordance with regulations drawn up by the communal council and sanctioned by higher authorities. No one can be appointed teacher of a public school, clergyman in the established church, keeper or nurse at a public insane asylum, or midwife paid from public means without producing a medical certificate that he or she is not suffering from an infectious form of tuberculosis. Similar regulations can be issued for other classes of officials and functionaries whose duties bring them into close touch with many people.

If a teacher or other official is dismissed on account of tuberculosis, he receives a pension of two-thirds of his salary, but he is required to accept an appointment similar to the one he had if he recovers.

If soldiers serving out their compulsory time of enlistment are attacked by tuberculosis, they are placed at public expense in an institution for the tuberculous.

In all prisons, insane and other asylums, almshouses, nursing homes, etc., if possible, provision must be made for placing such of the inmates as may be tuberculous in special wards, isolated from the healthy. If a tuberculosis patient is living under conditions which evidently threaten others with infection, measures can be taken to improve these conditions, and even compulsory admittance to a hospital can be resorted to. This is decided by the Epidemikommission, and the expenses are defrayed, one-fourth by the communal treasury and three-fourths by the State treasury, unless the patient is able to meet the expense, in which case he must pay himself.

The second tuberculosis law provides for the granting of State subventions for the erection of sanatoriums for the people, tuberculosis hospitals, and nursing homes for adults suffering from tuberculosis of the lungs or the larynx, for subventions to the seaside hospitals and seaside sanatoria for children suffering from tuberculosis of various organs. The State subvention is about equal to half of the

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building cost. A condition for receiving a State subvention is that the plans for the buildings must be approved by the ministry of justice and that the institution, when finished, submits to supervision of its management by the ministry of justice, this supervision being exercised with the assistance of the State board of health and the medical officers of health.

The law further prescribes for which classes of disease the institutions are to be intended, and what size each class of institution must have in order to be entitled to a State subvention, how much the daily expenses per patient may amount to, and that the State pays three-fourths of this amount, if the patients are members of medical aid societies sanctioned and subventioned by the State, or if they are in the same economic conditions. The last one-fourth of the expenses is to be paid by the medical aid society or by the communal fund for the relief of the poor (kommunale Fattigkasse) and the assistance given the patient in this way is not to be considered "poor relief" (Fattighjaelp), which latter would disqualify him from all civil rights of a citizen. Patients who are in the possession of means can be admitted to these State-subventioned institutions, but they must pay about 66 cents (2 kroner 50 oere) a day.

The result of these laws has been that there now is ample room for tuberculosis patients at the sanatoriums and hospitals built throughout the kingdom by the communes and by private societies, and that all requiring it, without delay, seek the most suitable treatment. The results are illustrated by morbidity and mortality statistics, which are found in Dr. Carlsen's paper.

V. SOME DEFICIENCIES OF THE SANITARY ADMINISTRATIVE SYSTEM.

It will have been remarked that so far nothing has been said of the deficiencies of our system and our measures. On one hand, it is not easy to find out precisely what should be pointed out to other countries as examples to be avoided; on the other hand, foreigners will probably of their own accord discover the deficiencies.

Denmark itself has, however, found out several drawbacks which will be mentioned here.

It is a matter of course that a legislation concerning the most varied hygienic questions would create more uniform conditions if it had legal binding power for all parts of the Kingdom and if its enforcement were a duty of the State officials. And we ourselves therefore consider it a drawback that it is left to the initiative of the very small communes to draw up by-laws concerning very important sanitary conditions, and also that the enforcement of these regulations is left to laymen, for they naturally are hampered and impeded in their duties by the fact that it is their neighbors and equals in station toward whom they are to act in the capacity of police authorities.

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This drawback is somewhat remedied by both the local chief of police and the district medical officer having a certain right to complain of negligence and to urge to activity. On the other hand, the system certainly has its advantages; it is possible to have suitable regulations for the special conditions of each locality enacted, while general legislation for the whole kingdom could not easily be made to suit the requirements of all districts, as it would be likely to contain too little for the large communes and too much for the small rural communes. As already mentioned, the sanitary by-laws have also the advantage that their regulations are considered as self-imposed, while the regulations of a general legislation for the Kingdom would be looked upon as autocratic encroachments on private matters. The defects of the sanitary by-laws are further remedied in this way: As soon as any sanitary condition becomes of importance for more than a restricted part of the Kingdom or for our relations with foreign countries, we endeavor to enact laws applicable to the whole Kingdom, which can supplement the regulations of the sanitary by-laws. We thus have laws regulating slaughtering and for the inspection of meat exported, for bakeries, and for butter exported, etc. In these matters the sanitary by-laws of the communes are in themselves very comprehensive, and many of the large boroughs have public communal abattoirs where all animals must be slaughtered, where all meat imported is inspected, and where the meat found unserviceable—infected with tuberculosis, trichina, septic, or otherwise unwholesome—is confiscated and subsequently destroyed.

Some people object to the system of paying the medical officers such poor salaries for their public duties by the State that they are obliged to earn the principal part of their livelihood by practicing privately. Their public duties thus become secondary ones, a condition of affairs which is not always conducive to the interests of the public. It can be said, however, that this drawback is of less importance than one would believe at the outset. Another drawback is that the local chief of police rather than the district medical officer is the highest authority in sanitary matters; but this is of no consequence, when, as is the rule, these two officials work well together. A new law which aims at improving these conditions is now being prepared and will probably be enacted before very long.

Its aim is to give the public medical officers a higher salary, to release them from having to treat the poor—in general, to give them greater authority and to make it possible that their public duties become their sole or, at any rate, their principal work. At the same time, it is desired to establish a special examination which the applicants for these positions must pass in order to prove themselves possessed of the special knowledge required by this official position.

Time and space do not permit of presenting in a detailed manner

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the contents of Denmark's public-health legislation on other matters. That part of the legislation which has been treated in the foregoing, however, probably embraces precisely those matters concerning which other countries might desire information.

The sanitary progress which Denmark has made has called for great pecuniary sacrifices, which must be continued in the future. The ratepayers are aware of this, but console themselves with the knowledge that, taken altogether, the prosperity of the nation has increased during the years these laws have been in force. Life has steadily become better worth living for the paupers and those without means, and the well to do will scarcely have suffered, although now and then some luxury may have to be given up.

[1] In Denmark an urban "commune" embraces a borough, a rural "commune" generally one, frequently two, and sometimes more parishes.

[2] In Denmark the preparation and sale of drugs for medical purposes is reserved to pharmacists who have passed a special examination and have received a special personal license. They are called "apothekere" (apothecaries), and the place where the drugs are prepared and sold are called "apotheks."

OUTLINES OF THE PROGRESS OF HYGIENE IN THE KINGDOM OF DENMARK.

Dr. I. Carlsen, Chief, Statistical Bureau, State Board of Health, Copenhagen.

The Kingdom of Denmark, area about 40,000 square kilometers, with 2,800,000 inhabitants, comprises the metropolis, Copenhagen (population about one-sixth, or, including suburbs, about one-fifth of the total), and 18 counties (amter). In the counties there are 74 boroughs (købstæder og handelspladser) which are towns whose populations range from 800 to about 100,000, incorporated, with special rights, dating far back, and situated in different parts of the country (44 in the islands and 30 in Jutland), mostly on the coast. Around these boroughs there are about 1,200 parishes, of which nearly all constitute a corresponding number of country communes. In several places two or three parishes form a single commune. The country communes have a population of between a few hundred and 10,000. About 40 per cent of the population of the Kingdom lives in the metropolis and the boroughs.

1 krone, Danish=100 øre, or about 27 cents.

I. Introduction.

The population of Denmark was in 1912 about 2,800,000 and has increased since 1860 by about 1,000,000. This is mainly due to the excess of births over deaths. In 1910 there were 72 inhabitants per square kilometer; in 1860 there were 42. This increase would have been greater if the United States, during the same period, had not drawn about one-quarter million Danes to America.

The death rate has greatly decreased, especially during the last half of this period, so that the mean length of life for a man 20 years old has been prolonged three years, and for a woman 20 years old

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three and one-half years.[1] The death rates for the first year of life likewise show a decrease, although not so significant as the total death rate.

The curves on the diagram do not, however, clearly indicate how large the decrease in reality has been, because the city and country populations are not considered separately, and because a great change of position of the two groups has taken place, so that the city population, with the larger total death rate, now constitutes a much greater portion of the total population than in 1860 (now about 40 per cent, then about 23 per cent). Great changes have also taken place with regard to the country population itself with respect to

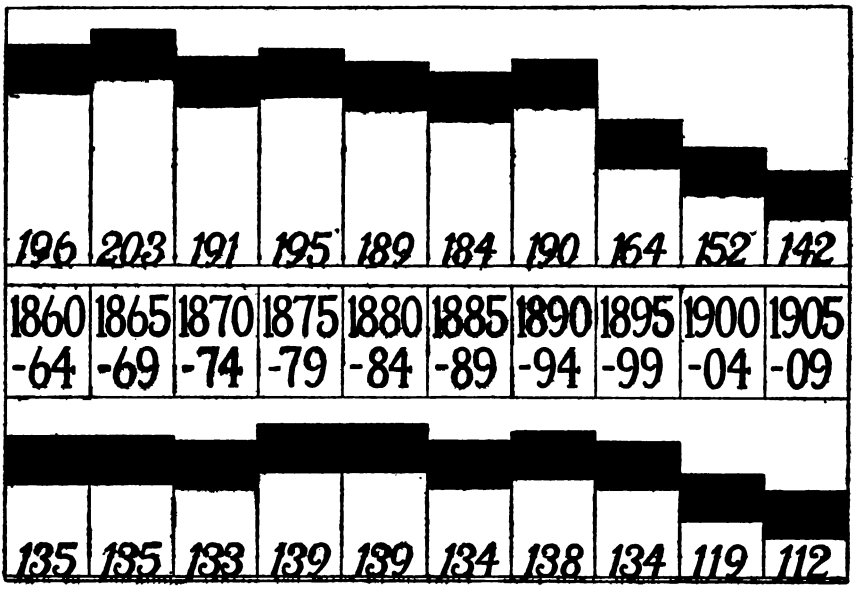

DIAGRAM 1.—Death rates of infants under 1 year of age, per 1,000 infants born alive; quinquennial averages, 1860 to 1909, Denmark. The upper part of the diagram gives total death rates in Denmark for quinquennial periods from 1860 to 1909.

moving together in what may be called "townships," which mostly are centers of trade and industry, and usually in connection with some railway station, the numbers of which have greatly increased (according to European scale) on account of the extension of railway lines; in 1858, 109 kilometers, and in 1910 about 3,445 kilometers. This change may be taken as an expression of the fact that Denmark, an agricultural country, is being transformed into an industrial country.[2]

These conditions, which statistics can not fully demonstrate, veil to a certain extent the decrease in the death rate shown by the curves. As a more accurate expression for the decrease in the death rate and

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the increasing saving of human life, diagram 2 has been drawn. This shows death rate curves for the population in the metropolis[2] for the whole period (purely city population, comprising one-sixth to one-fifth of the whole population of the country, and nearly one-half of all the town population, which is in the advance with regard to hygiene).

With regard to the whole country the decrease in the death rate can be traced in both sexes and all ages, and in the age classes having working ability the decrease is very pronounced.

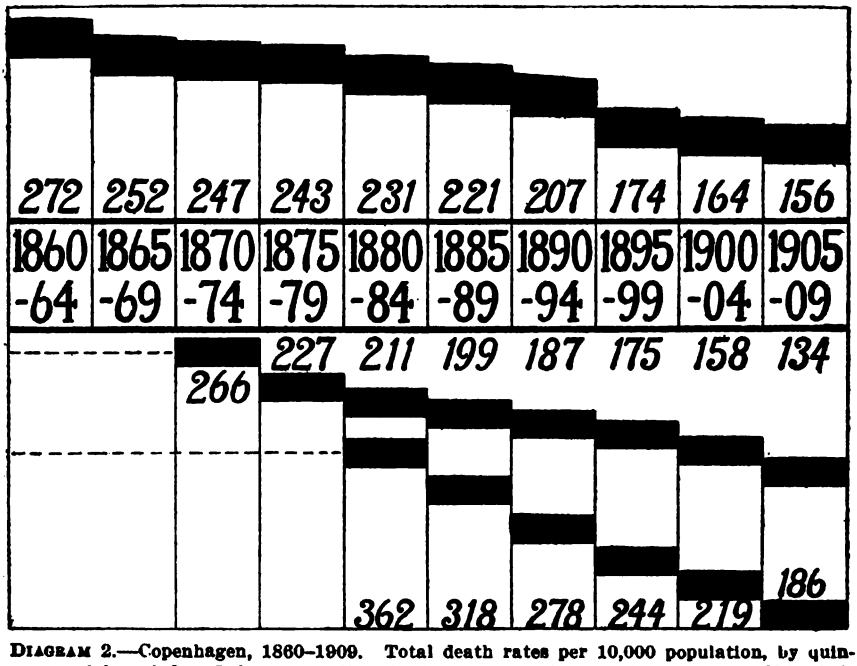

DIAGRAM 2.—Copenhagen, 1860–1909. Total death rates per 10,000 population, by quinquennial periods. Infant mortality (under 1 year of age), Copenhagen, 1870–1909, per 1,000 infants born alive, by quinquennial periods. Infant mortality (illegitimate), Copenhagen, 1880–1909, per 1,000 infants born alive, by quinquennial periods.

The decrease in the death rate is here, as elsewhere, a result of many factors, and it will be necessary to discuss some important contributing factors:

(*a*) NATIONAL DISASTERS AND OCCURRENCES IN NATURE, INFLUENCING THE ORDINARY MORBIDITY AND MORTALITY.

During the period 1860–1912 we have, almost at the beginning, the disastrous war of 1863–64, against two European powers; a time of trial, which paralyzed all progress, but which incited the energy and enterprise in the Danish population to prove that "what outward is lost, may inward be gained."

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The country has been spared large epidemics. The most severe epidemic during this period was the diphtheria epidemic of 1886–1895. This calamity furnished one of the motives for the development of hospital institutions. Cholera has not been epidemic in Denmark since 1857. The appearance of smallpox has been more and more rare. The spread of typhoid fever has greatly decreased and seems now to be dying out. Lepra, rabies, febris recurrens are unknown, and of typhus exanthematicus we have had only two small epidemics. Dysentery, formerly much feared, is now quite unimportant. No violent natural disasters have happened during this period. As a result of the development of agriculture, and the struggle to gain new ground by draining, the moisture in the ground has been considerably decreased. Probably on this account malarial fever, which was very common at the beginning of this period, has gradually decreased, and now is unknown.[4]

(*b*) NATIONAL PROSPERITY AND CONDITIONS OF LIVING OF THE POPULATION.

While the above-named serious diseases have been retrogressive, the country has undergone great economic development. The aggregate foreign trade amounted in 1865–66 to only about 5½ million tons; thereafter a gradual rise to 18 million tons in 1896, and then a rapid increase to about 33 million tons in 1910, about six times as much as at the beginning of the period. No great economic crises have occurred, only the ordinary fluctuation between good and bad times, and bad times in Denmark do not leave so deep marks as they do in other countries. When there are bad times for trade and industry there are good times, as a rule, for agriculture, which is yet the chief source of the nation's subsistence.

As a result of economic progress, the national wealth has gone up from 3½ milliards kroner in 1864 (19.70 kroner per individual) to 10 milliards kroner in 1910 (36.50 kroner per individual), and the national revenue per individual has increased from 210 kroner in 1870 to 450 kroner in 1908.[5] During this period Denmark has held the first place amongst the nations with regard to the amount of money deposited in savings banks. This amounted, in 1870, to 118,000,000 kroner, deposited in 168 savings banks; and, in 1908, to 839,000,000, deposited in 540 savings banks.[6] The savings banks yearly distribute considerable amounts of their surplus to charitable institutions. During the last 10 years 2,250,000 kroner has been distributed in this way. To this advance in the material prosperity come such benefits as the limitation of working hours, the observance of legal holidays, and holidays in the summer which are given by many manufacturing and business firms without any deduction of wages.

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The extensive growth of the cities, and of the townships in the country, together with the more numerous industrial undertakings, are of course changes for the worse with respect to general health; but this unfavorable influence is counteracted by building sanitation and factory sanitation, and the satisfactory way in which the business of dairying was transferred in the eighties from the farms and houses to cooperative dairies where the sanitary conditions are much better. These dairies are often subject to investigation and control.

Two important changes in the conditions of living of the people have taken place during this period. One of them is the reduced consumption of alcoholic drinks. The other important change is that fruits and vegetables have largely taken the place of meats as food. Fruits such as oranges, bananas, and apples are now consumed in the metropolis in such large amounts as never before, and the custom is growing in other parts of the country. In 1910, bananas to the value of one-fourth million kroner were imported into this country. Twenty years ago this fruit was quite unknown to the most of the people. Apples to the value of three-fourths million kroner were also imported. The colossal increase in the sales of Danish vegetables at the Copenhagen greengrocers' market during the last 30 years point in the same direction.

On the other hand, simultaneously with improvement in economic conditions there has appeared, especially during the last 10 years, an increasing tendency to pleasure seeking and enjoyment of life. The great increase in the yearly consumption of coffee and sugar points in this direction.[7] Likewise, we note the increasing consumption of tobacco. Cigarettes are very extensively smoked by school children and youths. In the higher social classes smoking is nearly as common amongst women as amongst men,[8] a phenomenon which was quite unknown a generation ago. In like manner there has been an increased consumption of candy, cocoa sweets, and licorice by children at the age when school attendance is compulsory, or even below this age. This increasing inclination toward the pleasures of life and the gratification of desire[9] has a certain connection with a weak trait of character in the Danish people, which has been known from time immemorial. The character of the people develops its best qualities in times of adversity rather than in times of prosperity. It is not unlikely that the change in the mode of living, spoken of here, has some connection with the spread of caries of the teeth. The above-named changes in the manner of living of the people, which are detrimental to sanitation, and whose effects on the physical type of the Danish race are studied by a private anthropological committee, which receives a subvention from the Government, do not seem to outweigh the effects of the health-giving and preserving progress. This is seen from the considerable decrease in mortality, and from

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the facts that the average stature of a grown-up Dane has increased 3½ centimeters during this period, and that a corresponding increase has taken place in the height of children of the freehold cottager and the tenant cottager during the period 1882–1906, but not in the children of the freehold farmer.

The lower classes of the population have had advantage from this progress. An analogy is shown here with regard to the mortality amongst children, of 0–1 year of age, from the different classes of the population. Whilst the mortality of children of the working classes of the city population decreases from 150 per thousand of living born in 1860–1879 to about 130 during the period 1886–1909, a

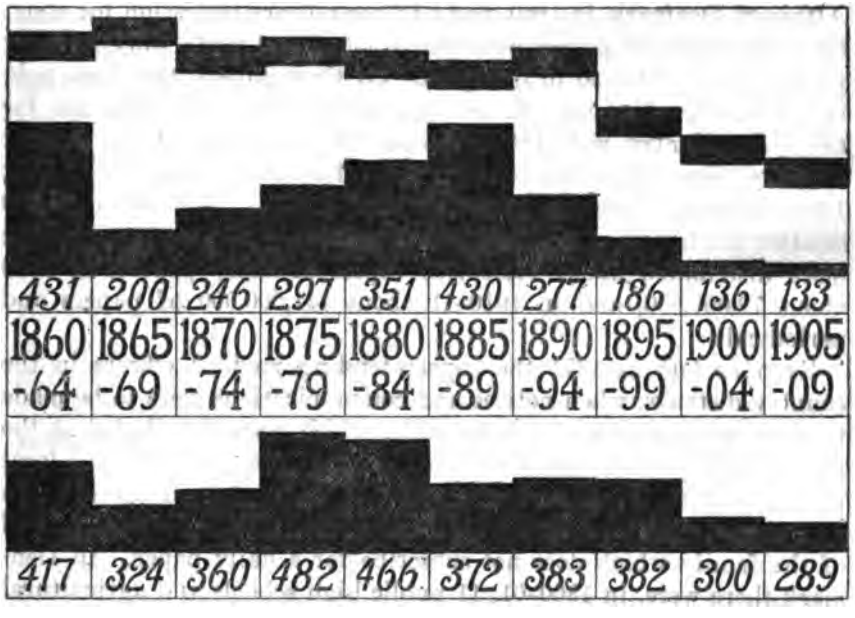

DIAGRAM 8.—Quinquennial death rates from measles, per million of population, in Copenhagen and the boroughs of Denmark, from 1860 to 1909. The upper part of the diagram shows the total death rates (all causes) for the entire Kingdom, by 5-year periods, from 1860 to 1909.

corresponding decrease can not be shown with respect to the other classes. Taking the population as a whole, it is beyond doubt that there is improvement in the resistance of the people against morbidity. Here we may probably find the explanation of the fact that measles and whooping cough, against the spread of which no special precautions are taken and which are more prevalent than formerly, do not cause as many deaths among the city population.

In order to get a better view over this change we may take the average of the quotients for the five first periods of five years and compare this with the corresponding average for the five last periods

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of five years. In the case of measles we then get a decrease of from 305 deaths amongst 1,000,000 inhabitants during the first half of the period to 232 deaths during the last half. In the case of whooping cough we get a decrease of from 410 to 345. The decrease is in reality greater than that shown by the figures, for the diseases are more prevalent. The pathogenic organisms must have become less malignant or the resistance of the infected must be greater now than formerly.

c. THE INTELLECTUAL DEVELOPMENT OF THE PEOPLE.

The granting of the free constitution in 1849 aroused the spirit of the people and formed the basis of their intellectual development. Although Denmark, in 1860, had had compulsory education for about 50 years and most people were able to read and write, only 11 daily papers were published in that year. Of these papers, two were published in the provinces. In 1899 the number of papers was 205 for the whole country, with 188 in the provinces. In 1905–6 the number of daily papers had increased to 241. To this we must add about 1,000 periodical papers (weeklies and others) and about 26,000 smaller publications (in 1902 about 14,000). In 1869–70 the post office distributed about 11,000,000 copies of daily papers, in 1898 about 72,000,000, and in 1910–11 about 141,000,000 of papers and periodicals.

Even as late as 1871 the superintending medical officers in the country districts, when notices and communications were to be made to the public, employed printed bills, which were distributed at the parish churches, at the taverns, and other public places, as the local press would be insufficient on account of its limited circulation. In 1912 there is in Denmark hardly a home having an independent head of the family which does not subscribe for a daily paper. In Denmark there were, in 1860–61, 11 public high schools and agricultural schools in which additional education is offered after pupils have passed through the compulsory children's schools. In these schools about 300 pupils were taught. In 1911 there were 78 public high schools and 19 agricultural schools, having in all about 8,178 pupils.

When we take into account the public education through numerous evening schools, technical schools, and business schools, the public libraries which are to be found in the country districts, and the numerous educational lectures, we may get a perception of how well educated the Danish population is. Denmark ranks fifth among European countries with respect to the number of letters sent through the mails per individual.[10] It was the extensive enlightenment of the country population, matched with Danish enterprise, which made possible the rapid transition from grain produce to dairying, which, more than anything else in the history of Danish agriculture, has

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compelled the attention of foreign countries. A general knowledge of sanitary matters has followed in consequence of the education of the people. Hygiene is taught in all higher schools, but not yet in the children's schools. Every year a certain number of the public-school teachers go through a course of instruction in hygiene at the State teachers' high school. Several private associations are working for the advance of hygiene, several magazines are published containing articles on popular hygiene, and numerous lectures are given about the country on sanitation and hygienic matters. Many daily papers have a special column, termed "hygienic adviser."

Two important movements have, during the last half of this period, contributed much to the advance of public knowledge on this subject: (1) The practical experience of the patients from the numerous tuberculosis sanatoria of the benefits derived from fresh air and a healthy mode of living. (2) The work done by Mr. I. P. Müller by means of his "demonstration" and writings. One evidence of the people's progress is seen in the decrease of quackery. In 1899 there were not more than 50 men and women practicing without qualification, most of them only on a small scale. In 1910 the number is much smaller and quackery is repressed as far as it is deemed possible; for as long as medical science is fallible, and belief in mysticism has root, quackery will persist. In 1867 there were at least 250 quacks in whom many people believed, whilst their faith in medical science, with the exception of surgery, was only very small.

The necessary soil for great hygienic advancement, namely, an intelligent population, gaining more and more in prosperity, has been present. The seed is to be sown by that profession which, without regard to selfish interests, has the duty to direct the development and be the instructors of the people, namely, the Danish medical profession.

II. The Medical Profession.

The Danish physicians receive a very thorough training[11] (7 to 8 years), and after having passed their examination they receive authorization to practice. The number of physicians has increased considerably. In 1850 there were 500 (1 for every 3,400 inhabitants); in 1890 about 900 (1 for every 2,400 inhabitants); in 1911 about 1,600 (1 for every 1,750 inhabitants). Of this number about 400 lived in the country districts (in 1860 about 100). Of dentists, who are authorized just as the physicians, there were about 10 at the beginning of this period, and at its close about 360. Their training takes place exclusively at the State Dental School, and they are required to pass the examination of this school before they receive authorization. In 1911 the public could buy medicines at 251 authorized "apoteker" (in 1860, 107), and also at the offices of about 200

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physicians, who have the right to supply compounded medicines. There are about 150 drug stores where only certain drugs can be obtained, but which do not make up prescriptions.

The Danish medical profession, which has a high social position, has in many matters taken the first steps for improvement without awaiting action by the administration. It was principally the association of physicians in the Provinces which, in the latter part of the fifties, caused the compiling of the Danish statistics of morbidity, which is more complete and covers a longer span of years than those of any other country. With that rapidity of action which is characteristic of the national character, when useful changes are desired,

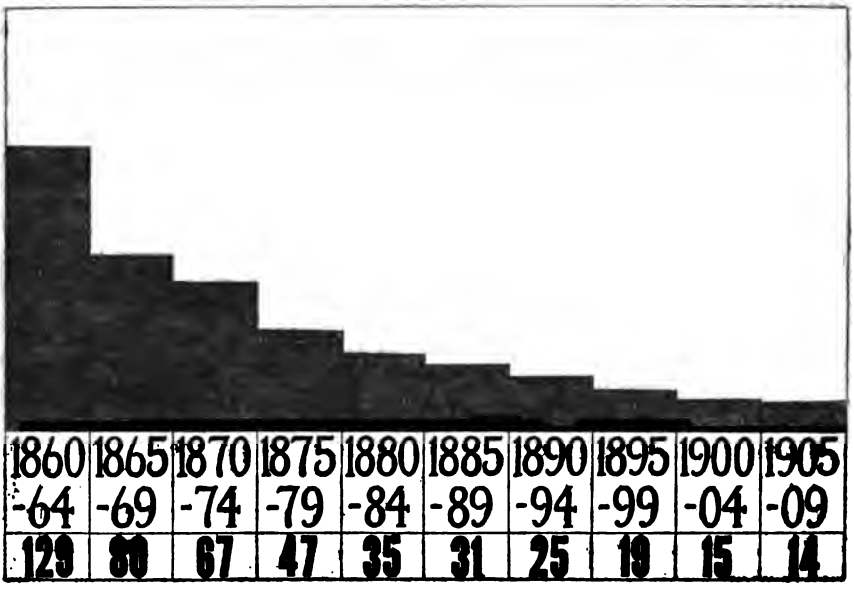

DIAGRAM 4.—Quinquennial averages of death rates from puerperal fever, per 10,000 births, in Copenhagen and the boroughs of Denmark, from 1860 to 1909.

the Danish hospital physicians introduced very quickly (in the beginning of the seventies) the Lister antiseptic treatment of wounds and of the puerperal state before any other nation, whereby the much feared hospital sicknesses disappeared and the puerperal fever has been reduced to a minimum, as the midwives gradually adopted antiseptic practice.

The Danish medical profession was also the founder of the medical aid societies, the development of which later became so extensive. The profession, through its organization, took up the fight against tuberculosis in this country, and as cancer seems to be spreading extensively it has recently appointed a committee on cancer, the efforts of which can be perceived already. Such useful undertakings as the founding of a sanatorium for physical therapeutics, the introduction

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of a more satisfactory distribution of milk, and many other improvements of that kind, have been brought forward by the profession and supported by its pecuniary contributions. Another trait of character of the Danes is that anything new and untried is looked upon with suspicion; for that reason the Danish medical profession has received with skepticism the numerous therapeutic meteors which have appeared in other countries and after a short time have disappeared from the horizon.

The profession has borne its part in the development of hygiene, and when the progress has not been so great nor so rapid as the profession had expected, the reason may be found in the fact that the freedom-loving people are slow to accept any new law restraining their liberty. The profession has overlooked the fact that our most important progress in hygiene has been effected with the consent of the people and that progress is made only in the same degree as the necessity is made obvious to the representatives of the people in the legislature.

III. Efforts to Create a Healthy Race.

The right to contract a marriage, in Denmark, is restricted only by a minimum age limit and by the condition that actual poor relief must not have been received.[12] Unmarried women with child have, since 1908, a claim on the alleged father for assistance during the last month of gestation. The Royal Hospital at Copenhagen, established in 1911, has a ward (15 beds) for pregnant women who are expecting difficult delivery, and the lying-in hospital erected by the State in 1910, at Aarhus (Jutland), has a similar but smaller ward. Several philanthropic societies in the capital give assistance to women in the last stage of pregnancy. The birth itself, the confinement, and the relations of the mother to the infant have received increased attention from the legislating authorities and by private philanthropy.

By far the greater number of births takes place with the assistance of authorized midwives (Jordemoedre), who have received a special training for this purpose. In 1860 there were about 900 midwives (1 for each 60 births), in 1911, about 1,100 (1 for each 68 births); and of these about 75 per cent were appointed and salaried by the State as district midwives. All midwives in their professional duties must follow a code of instructions (Instruks) and they are under the control of the medical officers (who are State officials). Through the midwives the homes receive important information on the nursing of infants, and the prevention of certain diseases is largely dependent on the intelligence and conscientiousness of midwives. It is therefore of importance that the social standing of this profession has been greatly elevated and that its financial standing has been somewhat (not greatly) improved. The midwives must in a great measure be

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thanked for the decrease in mortality from puerperal fever and also for the considerable decrease in stillborn infants.

Of 1,000 legitimate births during 1865–1869 there were 37 stillbirths; during 1895–1900, 23, while the relative figures for illegitimate stillbirths was 47 and 35. The profession, which in later years has been recruited from classes of a higher social standing has its own trades-union (Fagforening) and edits its own obstetrical publication.

In the country people without means can claim assistance from the communal authorities to have the midwife brought to them in a two-horse carriage (not actual poor relief, uegentlig Fattighjaelp). Birth assistance to paupers (payment to the midwife and for the bandages) is everywhere given by the communal authorities as not actual poor relief.[12]

There are in existence two lying-in hospitals established by the State, the one of which, that at Copenhagen, is some 150 years old but is being continually extended, and can receive about 2,800 patients a year, most of whom receive free treatment (unmarried women can on request be treated as secret patients, hemmeligt foedende), and secrecy concerning them is strictly observed by the sworn assistants. The other lying-in hospital, that at Aarhus, is half the size, and was established in 1910, giving free treatment for those without means. There are several smaller confinement homes, established during the last decades by charity.

At both the State institutions, and at several others erected by private philanthropy, there are nursing homes for mothers with infants. By the law of 1901 on the regulation of factory work mothers are allowed, only on producing a medical certificate, to work in factories during the first month after their confinement. Since 1735 legislation has done much for illegitimate children by fixing the duty of the alleged father to assist in supporting the child, but especially since 1888 the infant's and the mother's position has been improved by the fact that the communes take up the obligation if the alleged father evades his legal duty; that the amount of the support has been considerably raised; and that the age limit for the support of the child can, when necessary, be extended from the fourteenth until the eighteenth year. In 1908 divorced and deserted wives, with children, secured the same right, and there is at present awaiting the consideration of the Danish Diet a bill elaborated by the Government for similar aid to indigent widows with children. It is assumed that 30,000 children would be affected by this bill.

Care of children.—Private philanthrophy is very active, especially at Copenhagen, in assisting mothers with children, who are not provided for, in giving information with regard to having children adopted [13] or put out to nurse, and with regard to securing board,

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clothing, etc., for them. Of special importance are the so-called cradle homes (Vuggestuer), where the mother, while she is at work, can have her infant looked after free or for a slight charge; asylums and free-time homes (Fritidshjem), where school children can be looked after during the hours when not at school or in their own homes; the Börnehjem and Plejehjem institutions (about 100) which care for and educate the children until they are of an age to support themselves. Some of these are purely communal; many of them private institutions, but subventioned by the State. The majority have come into existence during the last 20 years.

Children who are being brought up by others than their parents (Plejebörn) are, since 1888, under public supervision, and the very important guardian council (Vaergeraadsinstitution), which was created in 1905, has great authority to interfere at public expense when children are negligently cared for, bodily or mentally, and can take children away from their own parents. According to the opinion of several medical men it would appear that artificial nourishment of infants is not on the increase in Denmark, apart from the cases where it is made necessary by social conditions.

School hygiene.—As regards school hygiene, there has been great progress principally in the arrangements of the school localities far beyond the regulations fixed by the law enacted in 1856. This has especially been the case since 1882, owing to the voluntary activity of the communes (Copenhagen, however, was already, in the seventies, at the head of the development), and since 1904, when the State took action by granting subventions for the erection of new schools (or for alterations in already existing ones), when based on plans sanctioned by the State, the improvement of school localities has been carried on with great speed.[14]

A regulation made under the law on tuberculosis, enacted in 1905, which concerns the cleansing of schools, has likewise greatly influenced school hygiene. During the last 10 years school doctors (Skolelaeger) have been appointed at many schools (in 1911 about 40, half of which are at Copenhagen) and likewise a few school dentists (Skoletandlaeger).

Gymnastics have for about 100 years been compulsory at public schools and great progress has been made, especially in the last 20 or 30 years, after the State had established training courses in gymnastics for teachers.[15] In the boroughs all the 190 public schools in 1909 had gymnasia; in the country this was the case with about 20 per cent of the schools. In Copenhagen 61 per cent of the schoolgirls take part in the gymnastic instruction; in the provincial boroughs, 92 per cent; in the country, 38 per cent.

Great interest is taken in gymnastics, principally in the country, by the growing generation, especially those young people who be-

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come members of the associations of volunteer marksmen (Skytteforeninger), existing since the end of the sixties.[16] All the public high schools (Folkehöjskoler), also the agricultural and gardening schools, have gymnasia, and the high status of Danish gymnastics has for years been well known abroad.

Home handicraft (slöjd) is in many places taught at school, and since 1910 the establishment of slöjd localities in the school buildings is subventioned by the State.

Ball games and games with fixed rules are made use of in most town schools and in about 60 per cent of the rural schools.

All sports (idraet) are highly esteemed in Denmark, where also such international movements as the volunteer Christian association of boys and the Scout movement have become firmly rooted. Cycling is extremely popular among both men and women (in the country about every other farm hand, male or female, owns a cycle). The city of Copenhagen has for many years during cold weather opened a large open-air skating rink, free for all, and when planning the new, large Faelledpark special attention was paid to open-air pleasures for children.

Bathing is not as popular as the nature of the country would seem to imply, but here also progress can be noted, for over half of the town schools and many of the rural schools have bathrooms for their pupils. Popular bathing establishments (including seashore baths) have been installed in an increasing number during the second half of this period. A great many of the cooperative dairies have installed bathrooms with warm baths, which are used by the people of the neighborhood.

The following institutions have done much to induce the youth of the towns to enjoy life in the open: The popular kindergartens (Fröbelske Folkebörnehaver); the Skolehaverne (school gardens) (some 130 schools have divided their grounds into small garden plots, to be cared for by the scholars); the colony gardens (kolonihaverne), which are continually increasing in number (now about 20,000), surrounding Copenhagen and the larger provincial towns; the Playground Association (Legepladsforeningen), which secures playgrounds for children; the summer vacation trips (sommerferierejserne), which are a kind of migration of children from the capital to the country. They can travel free by rail and steamer, but must themselves secure accommodations in the country, either with relatives or acquaintances, or with hospitable country folks with whom they come in touch by the help of a committee. This last institution has existed since 1854, increasing year by year, so that now about 20,000 children, or 40 per cent of Copenhagen's school children spend their summer vacation in the country, many of them being supplied

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with clothing by some charitable institution. Vacation colonies (feriekolonierne), that is to say, colonies of boys, under the guidance of teachers, who are sent out to country high schools or similar places for 14 days. In 1912 there were about 2,000 boys in the vacation colonies.

Since 1873, the work of children and young people in factories and the regulations for apprentices have been satisfactorily cared for by various laws.[17]

Finally, it can be mentioned that the compulsory conscription (almindelige vaernepligt), which requires a stay of a half year or more in the recruit schools and which has existed during the whole period, has for many a young man of 22 to 25 years proved a means to physical and mental development, especially of late years, since the young men during their training are cared for in various ways, by improving their rations, by protecting them against the coarse treatment of noncommissioned officers, and by efforts to strengthen their powers of resistance against the various temptations of garrison towns.

IV. Measures Against Poverty and Alcoholism—Compensation to Workmen, and Insurance.

In these matters we find evidence of variability in the Danish national character. On the one hand we have that softheartedness and humaneness which made Denmark the first nation to abolish slave trading and one of the first nations that organized the life-saving service along its coasts. (During 1852–1910, 8,837 lives were saved on the Danish coasts, or about 150 lives each year.) It is also a country in which we find well-developed benevolence and charity, in which prevention of cruelty to animals is a marked feature. During the last decades the population, without complaining much, has paid the heavy taxes necessary for extensive social reforms. On the other hand we find that desire for good living and enjoyment of life which, among other things, is at the root of the large consumption of alcoholic beverages. We have in the voluntary associations actively seeking means for the limitation of alcoholism and in the voluntary medical aid societies evidences of energy and will power quite in contrast with such other things as carelessness in the education of the children and frequency of suicides. During this period destitution has not been great and is doubtless decreasing rapidly, especially outside of the metropolis and the larger cities. It is estimated that one-third of the adult males who apply for relief have become impoverished by strong drink, another third by idleness, stupidity, or lightmindedness, and the last third by causes beyond their control—sickness or want of employment.[18] With respect to

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women the situation is quite different. Measures for the prevention of alcoholism as found in Denmark have been taken by the people themselves. The figures given in the literature of other countries concerning the spread of alcoholism in Denmark give a somewhat exaggerated conception of the facts, as they do not take into account the constantly increasing use of alcohol for technical purposes. The great progress made by the temperance movement will be seen from the following figures giving the number of members of the abstinence societies. These are drawn principally from the middle classes and the working classes:

In 1885, about 22,000; in 1895, about 55,000; in 1905, about 137,000; and in 1910, about 170,000.

The temperance movement has now become a significant social factor whose educational influence on the population is shown in several ways. The number of public houses has diminished,[19] as has the consumption of wine, corn brandy,[20] and Danish Bavarian beer. The Government pays subsidies to the temperance societies, and excise is imposed in an increasing degree on the alcoholic products of the country. The temperance movement has also received support from an act passed in 1910 concerning the internal arrangement of public houses and by the appointment of a committee to institute legislative measures on this subject. The temperance movement has since 1890 built 13 inebriates' retreats, in which 250 patients may receive treatment. The Government pays a small subsidy to this work.

The insurance principle, brought forward by the public itself, has an important place among measures against poverty. This is especially the case with regard to the act of 1892 concerning the medical-aid societies, whereby these societies received Government grants. The medical aid societies provide their members with free medical aid, medicines, and free treatment in a hospital, and, besides this, a daily allowance of money during sickness. In 1893 there were 457 medical-aid societies subsidized by the Government, having about 117,000 members above 15 years of age (about 8 per cent of the population of this age). In 1910 there were about 1,500 societies, having about 667,000 members above 15 years of age (about 37 per cent of the population of this age).

In the course of 18 years these societies have reached a membership exceeding one-third of the population of the country, a development so great that similar institutions in other countries can hardly have equaled it. The members themselves have, in 1910, contributed about 5,000,000 kroner, the Government grant amounted to about 2,500,000, and all the communes which have hospitals gave valuable aid by fur-

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nishing hospital treatment at a very low cost.[21] The physicians render treatment at reduced fees, and the apothecs give about 14 per cent discount on medicines. The voluntary insurance principles have furthermore resulted in the establishment of the fishermen's accident insurance (1900), and the insurance against unemployment (1907),[22] likewise insurance against accidents sustained through agriculture, forest culture, and horticulture (1908). These institutions receive considerable Government grants.[23] The protection of the working classes has furthermore been extended through the following acts, some of which have been mentioned before: An act concerning the employment of children and of very young people in factories (1873). Prohibitive measures against the manufacture and sale of the once so commonly used sulphur matches (1874). Inspection of stationary steam boilers (1875 and 1909). Act concerning apprenticeship (1889). Law concerning accidents caused by machinery (1889). Enactments concerning bakeries and confectioneries (1906). Acts concerning holidays and closing of shops and storerooms (1904, 1908, 1909). An act concerning the employment of foreign laborers (1908). An act concerning the internal arrangement of public houses (1910). The factory act of 1901. Also by enactments concerning insurance against accidents in industrial establishments (1898).[24] Seamen's compensation act (1905 and 1906).[25] Enactments concerning accidents in agriculture, forest culture, and horticulture (1908) only with respect to the larger businesses.[26] These last three acts insure the workingman compensation at the expense of the employer without any contribution on the part of the workingman.

Since 1900 the Government has furthermore granted loans, at a very low rate of interest, to the country population, so that land may be bought, and thus assist that class of rural population called freehold cottagers.[26]

The arrangements for the relief of the poor, which are in force at present, are according to an act of 1891 (amended later), and the essential improvements which have been effected concern the view taken of the poor people's position, and of the aid given in the form of relief which does not have the effect of actual poor relief, with respect to the recipient's position toward the municipality and the Government.[12]

Besides the cases already named, one must also mention free treatment for those unable to pay in institutions sanctioned by the State, such as asylums for insane, imbeciles, epileptics, blind persons, deaf-mutes, and persons affected with lupus, tuberculosis, and scrofula. The stay at these hospitals, traveling expenses, support of the family

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in certain cases (for instance, when a breadwinner, affected with tuberculosis, is sent to a sanatorium) is paid for by the municipalities, but is not counted as actual poor relief.

In several other ways the treatment of the poor has become more humane. Relief is rendered in their homes more often now than formerly and the use of the poorhouses and the poor farms has diminished considerably. In many places the poorhouses are without inmates. Children and decent persons are kept from all intercourse with vagabonds and drunkards, and husband and wife, except in extreme instances, are not separated. The food which is supplied in these poorhouses is much better than formerly, and its quality is fixed by rules approved by the Government.

Before applying to the relief officers for assistance, poor people may apply to the various aid boards (Hjælpekasser) which are to be found in every commune. These were established in 1907, being reconstructed from a very old private institution, and received the support of State and communes, working to keep people from applying to the pauper administration by giving them pecuniary aid, which consists principally of grants from the communes. Another institution of a like character is the Society for Providing Hot Meals for Poor School Children. This was a very small and private institution, in 1881, when it started at Copenhagen, but is now a very large institution, doing able work in the months of severe winter. This institution has also been started in several of the provincial towns and everywhere it receives ample support from the commune.[97]

In 1909 Government and municipal grants to poor people (both actual and not actual poor relief), to aid societies for the unemployed, to other aid societies, and to medical aid societies amounted to about 14,500,000 kroner. If we add to this amount another 10,000,000 kroner, which is the Government and municipal grant for old-age pensions, and which has greatly diminished pauperism in this country, we reach a sum amounting to about 10 per cent of the united revenues of the Government and municipalities. Year by year this sum increases, especially the grant to the old-age pension fund, to medical aid societies, and to not actual poor relief. (The not actual poor relief for 1909 is estimated at about 1,000,000 kroner.) To this one should add the private benefactions, a very large amount, constantly increasing, and given especially to children's aid institutions. In 1909 about 500,000 kroner were given to these institutions in the capital alone. Statistics which may be relied upon are difficult to procure with regard to the amount of the private charities, and figures which may be of any use are only to be had from Copenhagen and the large towns. According to these figures, about 4,000,000 kroner are given away in these cities yearly. In this amount is

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included the value of numerous free dwellings and dwellings let at reduced rent. When the charities which are dispensed in the country districts are taken into account, together with that which is not statistically compiled,[28] it is estimated that at least 6,000,000 kroner are offered for charitable purposes in Denmark every year, more than 2 kroner yearly per inhabitant. In Denmark many bequests have been made with a view to assisting people who are in want. These legacies amount to at least 50,000,000 kroner, the interest from which is included in the above 6,000,000 kroner, and the capital of which is increased every year by new legacies.

If we add these 6,000,000 kroner to the before-mentioned 24,000,000 kroner, which is the Government and communal grant (besides the millions which are spent in administration), we reach the sum of about 30,000,000 kroner, which amounts to more than 10 kroner per inhabitant. This affords some expression of the wealth of the country and the kind-heartedness of the population. It is a fact that this amount is increasing every year and that actual want, hunger, and cold are on the decrease, whilst the effects with regard to hygiene for the poorer part of the population can not be denied. On the other hand, it is not so certain that personal qualities of the recipients, which when taken together should form the basis for all self-help, have during the same time grown in proportion to the assistance rendered. The more freely money is distributed, and the more money given away, the less is the sense of honor and the will power. This fundamental social rule is probably as valid as ever.

V. The Fight Against Pollution of Earth, Air, Water, and Provisions.

As far as regards the keeping out of unwholesome matter from the air, the drinking water, and provisions in general, Denmark has been a pioneer only on a few points.[29] At the beginning of the period the laws governing these conditions were few [30] and circumscribed, and during the period, apart from the laws mentioned in note 30, and certain previously mentioned laws for the protection of working people in factories and the law on the arrangement of places of refreshment (Bevärtningssteder), the State interfered only with a few laws, such as that of 1900 for the examination of provisions, that on the manufacture and sale of margarine (1891), the laws on waterworks (1896 and 1907), and the laws on the examination of the meat of animals slaughtered within the Kingdom (1906). Progress has been effected principally by means of the local sanitary by-laws. Development has been slow, aided at intervals by local epidemics, but, step by step, a high standard, when com-

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pared with other countries, has been reached as regards the keeping clean of towns and dwellings and as regards the improved control of food materials.

With reference to A. Johansen's presentation of the status präsens, the following will give a brief synopsis of the influence exercised by the most important sanitary laws, viz, the law of 1858 for the enactment of sanitary by-laws following the cholera epidemics, renewed in 1862, and in 1868 made permanent. The law demands the enactment of sanitary by-laws in the boroughs (towns), but makes the enactment of sanitary by-laws in the rural communes a voluntary matter. Any sanitary by-law for a rural commune, which has been sanctioned by the ministry, is a local law. A commune can at any time, after informing the ministry, repeal its sanitary by-law; but this occurred only a few times in the course of the 40 years. In 1885 the number of rural communes having sanitary by-laws in force only amounted to 131, about one-eighth of the number of rural communes. Thereafter progress was rapid. In 1890 33 per cent of the rural communes had sanitary by-laws, in 1910 56 per cent. On the islands only 26 per cent of the rural communes were without sanitary by-laws in 1910, but in Jutland the percentage was 60 per cent. Many of the sanitary by-laws, especially the older ones, are very brief, and not truly in force, for the great majority have not provided for their enforcement, which throughout has been undertaken by the police, and they have failed to provide a medical member of the local sanitary committee (Sundhedskommission). The fact that a sanitary by-law exists, though apparently dormant, is of a certain importance, for when necessity calls it can be awakened and made effective. With the lapse of time and spread of information the rural sanitary by-laws have been amplified, and a steadily increasing number of medical men are being elected members of the local sanitary committees. The slow development is due to the magnitude of the reforms demanded by the medical profession, which frightened the population, and perhaps partly due to the fact that the ministry of justice has only in recent years applied to medical experts for guidance when sanctioning sanitary by-laws. The people are unwilling to bear great monetary sacrifices for purposes whose importance is not clear. All sanitary by-laws provide far better for the supply of drinking water than for the disposal of refuse and excrements, which are highly esteemed as fertilizers. In those boroughs which still contain many agricultural inhabitants, the development of drainage and the removal of refuse has been slow.[21]

The capital possesses a complete system of sewers, which was extended in 1901 by the erection of pumping stations for carrying the sewage out to deep water in the Oeresund. The number of water-

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closets is increasing year by year. The refuse and night soil is carted away to dumping grounds. The water supply is arranged in a manner fully befitting a metropolis.

Nearly all provincial towns (64 out of 74) have a complete system of sewers; only 10 towns, of small size, have incomplete systems of sewers. Water-closets exist in a number of provincial towns; otherwise the tub system is used. No town uses only privy pits. Refuse and night soil are removed completely in all larger towns, and in some of the smaller ones; in the others it is used in the gardens; 65 towns of 74 have a central water supply; 2 others are erecting waterworks; 7 have no waterworks.

The following schedule will show the progress made since 1860 and also that development was greater in 1890–1909 than in 1860–1890.

TABLE 1.—*Of 73 (74[a]) provincial towns, the following were provided with—*

	Drainage.			Removal of the night soil.			Central water supply.
	Complete sewers system.	Partly sewers, partly open gutters.	Open gutters.	Partly tub system, partly water closets.	Partly tub system, partly privy pits.	Only privy pits.	
1860	(?)	[b] (?)	(c)	(?)	(?)	(c)	4
1890	22	12	39	ca 20	20	33	25
1909	64	5	5	ca 56	18	0	65

[a] Esbjerg became a borough in 1899. [b] Very few. [c] All, or most.

In the rural districts progress has been at least as great, but unfortunately no statistics exist. In 1860, out in the country, a privy was a rarity, even among very well-to-do farmers, but now it is a rarity to find a house without a privy (only in those districts which have neither building by-laws nor sanitary by-laws). Formerly the dunghill was placed in the middle of the farmyard, generally dangerously near the well, and when it rained the liquid manure flowed over the yard. All the farmyards and small farm buildings built during the last 10 years have their dunghill outside of the yard and arranged in such a way that the manure liquid can collect in a water-tight cistern (Ajlebeholderen). Progress in agriculture has caused this change, and it is clear that monetary advantage has been an incentive to progress in human hygiene. It would be strange if the Danish farmer should take long to understand that the good results obtained from light, fresh air, cleanliness, and good caretaking as regards domestic animals are equally applicable to human hygiene. It is a fact that progress in agriculture leads to progress in human hygiene.

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In one direction statistics can be produced for the better understanding of progress. The cooperative idea, so popular in rural Denmark, has during the last 10 or 15 years busied itself with the erection of numerous small central waterworks, driven by wind motors, or other motors. There are now at least 319 such waterworks, distributed among the 1,143 country parishes, and 259 of them were erected in the course of five years (1903–1908). A group of houses and farms (the number of persons rarely exceeds 200) is supplied from such a plant, in the erection of which expert guidance was unfortunately not always sought. Here, too, it was partly the consideration of cattle and of dairies which brought the inhabitants a step further on in human hygiene. The rapid increase of these cooperative waterworks is a new evidence of the quickness with which the conservative Danish farmer can effect a change of front when moved by economic considerations.

As regards the inspection of provisions, this is principally governed by the regulations of the communal sanitary by-laws, and development in this direction has been nearly along the same lines as the general development of the sanitary by-laws. The capital and the larger provincial boroughs all have a thorough system for inspection of meat, with public abattoirs (slaughterhouses); and, in most of the smaller provincial towns, as in a number of rural communes, the sale of meat is supervised by a permanently appointed veterinary surgeon.[32] Of late years the butchers in several places in the country have formed voluntary organizations for the establishment of meat inspection.

The inspection of milk has gradually become highly developed, in general, through the local sanitary by-laws, especially since the agricultural revolution in the eighties; later on, from fear of the spread of tuberculosis from cattle to human beings, and also in order to restrict the mortality among infants. The initiative was taken by a private philanthropical society, Copenhagen's Milk Supply (Københavns Mälkeforsyning) which, in 1878, established a controlling organization, which has since served as a model for many places abroad.

The hygiene of building is advanced outside of the capital partly by sanitary by-laws, partly through laws which serve as a guide for the voluntary enactment of building by-laws after the fashion of the sanitary by-laws. The progress of the introduction of building by-laws keeps pace with the introduction of the sanitary ones.

Of special importance for building hygiene in the boroughs was the enactment of a law by which the State grants cheap loans for the tearing down of insanitary quarters and for the erection of dwellings for working people.

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Danish progress in this department of hygiene is clearly expressed by the decrease in frequency and mortality of typhoid fever which appears from diagram 5, showing, by periods of five years, the death rates from typhoid fever per million inhabitants of the towns. This decrease can be taken to apply to the total of the Kingdom's population, for the towns are spread over the whole land and a similar decrease is observed in the notification which all medical men must give of cases of typhoid fever appearing among the rural population. A large majority of persons attacked by typhoid in the rural districts are sent to the hospitals, for free treatment, and to avoid the spread of infection to the dairies. The hospital statistics therefore indicate

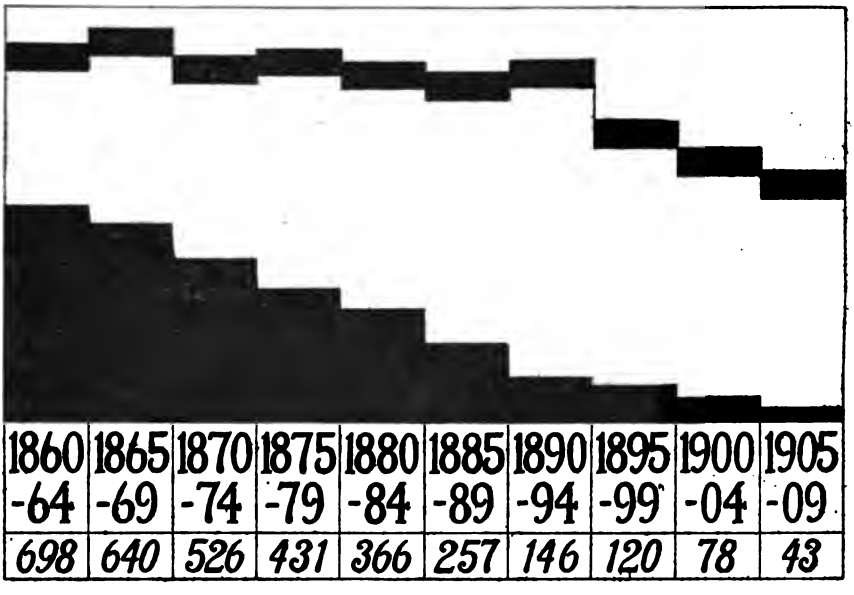

DIAGRAM 5.—Quinquennial death rates from typhoid fever per million of population in Copenhagen and the boroughs of Denmark from 1860 to 1909. The upper part of the diagram shows the total death rates (all causes) for the entire kingdom, by five-year periods, from 1860 to 1909.

the frequency of this disease in the rural districts. For the year 1910 it can be said with utmost confidence that the number of deaths throughout the Kingdom did not exceed 75 (32 in the towns, the rest in the country). This number, when compared with the population of 2,800,000 and with the deaths from all causes (35,000) is practically infinitesimal. The number of patients in 1910 was, according to the notifications from the medical men, 639, and will in reality scarcely have exceeded 700.

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The continual decrease in this country of mortality from typhoid fever gives hope for the complete disappearance of the disease, which at the commencement of the period was extremely common. It is, however, evident that other factors than progress in hygiene have contributed to the decrease in frequency and mortality.

VI. Institutions for the Treatment and Boarding of Sick, Abnormal, and Old People not Provided for by the Pauper Administration.

Concerning this matter this country can regard its past with satisfaction, and, in some respects, Denmark occupied, at the commencement of the period, a prominent position.

Infirmaries.—As regards infirmaries, the progress has been enormous, connected to some extent with the progress which has taken place in all civilized countries, and owing partly to special Danish conditions, such as free treatment in hospital of all cases of venereal diseases, according to the law of 1874; the frequent isolation of epidemic infirmaries in the struggle against epidemic diseases; the steadily improving management of medical-aid societies; old-age pensions; and the struggle against tuberculosis, which have greatly increased the country's supply of infirmaries. The State maintains a large national hospital in Copenhagen and a few private infirmaries and health institutions are partly supported by the State, but the majority of the infirmaries are supported and managed by the communes.

In Copenhagen, which has been in the lead from the beginning of the eighteenth century amongst the large cities of Europe as regards the supply of infirmaries, there were, in 1860, two large infirmaries and a small children's hospital, with altogether 660 beds (43 beds for each 10,000 inhabitants); in 1884 were to be found 6 large infirmaries for ordinary use, 1 large children's hospital and 2 epidemic hospitals (1 large, 1 small), with altogether about 2,300 beds (84 beds for each 10,000 inhabitants); in 1911 were to be found 14 large infirmaries, amongst which were 2 children's hospitals, 2 epidemic hospitals, and 3 tuberculous (lupus) institutions, with altogether about 4,700 beds (106 beds for each 10,000 inhabitants). Institutions for mothers giving birth, feeble-minded and abnormal people, and wards in prisons are not included with the infirmaries.

Outside Copenhagen there were very few infirmaries in 1860—only 31 small infirmaries and 15 small hospital departments of workhouses, poorhouses, and similar institutions were to be found. The greatest number of beds in a provincial hospital was 50, and only 5 were situated outside the boroughs. The number of beds can not be exactly specified, but can be calculated to have been about 900

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(5 beds for each 10,000 inhabitants); in 1870 the number of infirmaries had increased to 72, with about 1,200 beds (estimated); in 1884 the number was 78, with 1,800 beds. The later development will be seen from the table below:

TABLE 2.—*Infirmaries and health institutions outside Copenhagen.*[33]

	Infirmaries in boroughs (towns).	Infirmaries in the country.	Total.	Number of beds.	Beds for each 10,000 inhabitants.	Number of beds used for—	
						Epidemic diseases.	Tuberculosis (scrofula).
1884.....	73	5	78	1,800	10.0	(?)	100
1890.....	98	14	112	2,900	15.5	600	150
1899.....	100	31	131	5,000	24.4	2,200	325
1910.....	116	56	172	7,650	34.0	2,700	2,400

When the figures for the capital and the rest of the country are added together, we get, in 1910, 12,400 beds, i. e., 46 beds for each 10,000; but when to these are added the beds in the military infirmaries, in private infirmaries, in institutions for feeble-minded, abnormal people, in the above-mentioned departments in special institutions in short, all other beds destined for the treatment of sick persons, we arrive at the number of more than 22,000 for the whole country, corresponding to 82 beds for each 10,000 inhabitants, a figure which perhaps has not been reached by any other country.[34] The great increase in the number of beds in infirmaries during the last decennium is for the greater part owing to the struggle against tuberculosis.

The increase in the number of beds has been accompanied by a revolution of hospital hygiene in the provinces, and the progress of surgery has brought increasing benefit to the people of the provinces. They need not now, as in earlier days, to resort to the capital in serious cases of illness, for highly-trained physicians are found in all large and medium-sized infirmaries.

The admittance to the country infirmaries is easy for the great majority of the people. The State and the communes contribute large amounts. For poor persons, under certain conditions, for members of medical-aid societies or, under epidemic conditions, in cases of venereal diseases, or of specially contagious tuberculosis the State and communes pay the expenses. Confidence in the efficiency of the medical profession, and in the advantage of infirmary treatment, has increased with the increase of the number of beds. In the real infirmaries outside Copenhagen, and its large neighbor commune, Frederiksberg (institutions for tuberculosis not included), were treated, in the years 1873–1882, an average of 9,000 patients annually, with a mortality of 8.4 per cent; in 1890 about

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17,000 patients, with a mortality of 8.5 per cent; in 1908 about 35,000 patients, with a mortality of 8.8 per cent. In Copenhagen at present half the deaths take place in the infirmaries, indicating the extent of the use of infirmaries.

Attendance on the sick.—Until 1870 women of the lower classes, without any special training, were the attendants on infirmary patients. All nurses now undergo a training in the infirmaries lasting from 6 months to 3 years. Three years' training, as preparation for regular employment, is now demanded by all large infirmaries and by the Red Cross, which was established in Denmark in 1875 and now has a staff of about 60 nurses.

Outside the infirmaries and the boroughs, nursing in the homes is carried on by nursing associations, philanthropic unions, which, with some assistance from the State, pay for 6 to 12 months' training in an infirmary, for a woman of the peasantry, afterwards offering her regular employment as a nurse for the members of the union, and for people in distress outside the union, where she works without remuneration, also assisting in the general housework, where this may be required.

This institution, peculiar to Denmark, has promoted the calling in of medical assistance in the country and has been of extraordinary value. The first 54 associations were formed in 1884, and in 1898 there were 169 associations; in 1911 there were about 600 associations, in more than half the rural parishes.

As regards family nursing in the small boroughs and in the country Denmark perhaps occupies a very high position among civilized nations. In 1898 there were in Denmark about 1,000 trained nurses; in 1911 the number had increased to about 2,300, of whom about 1,400 had undergone 3 years' training.[35]

Asylums for lunatics.—The treatment of lunatics in Denmark is given almost exclusively in asylums.[36]. There were, in 1910, four large State institutions, one large municipal (Copenhagen), and a good many smaller municipal institutions, with room in all for 4,350 persons (16 beds for each 10,000 inhabitants).

The need of more room for the insane is very great, and in the near future a new asylum will be erected by the State. At the beginning of the period the Copenhagen Lunatic Asylum and two State institutions, together with a few communal institutions, had room for about 1,500 persons; in 1885, room for about 2,500 persons could be found in five large and some smaller municipal institutions. As previously mentioned, the asylum treatment is free of charge to people who are unable to pay.

Institutions for feeble-minded.—In taking care of the feeble-minded private charity made a start in the beginning of the fifties,

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strongly supported by the State, and in 1860 there was an institution for the feeble-minded, with room for 42 persons. In 1880 there were to be found in various institutions, the status of each of which was settled according to the extent of weakness of mind of its patients, altogether about 400 beds; and in 1910[37] the number of beds had increased to 2,450 (9 beds for each 10,000 inhabitants), partly in various institutions belonging to the two older freehold institutions controlled by the State (one for the islands and one for Jutland) and partly in the State institution erected in Jutland in 1907. Great progress has been made during recent years in the erection, on an isolated island, of an institution for adult criminally inclined imbeciles, the need of which had been felt for a long time.

Support in institutions for feeble-minded persons has been furnished by the communes to people without means, and such assistance is considered not actual poor relief.[12]

Institutions for epileptics.—In the care of epileptics the country has only lately followed the general development. Private charity, assisted by the State, in 1898 started an institution with about 50 beds. Two institutions have been added since, so that there is room in all the institutions for about 300 persons. Support of patients is furnished by the communes, and is considered not actual poor relief.

Institutions for the blind and the deaf and dumb.—Since 1811 the blind have received special care from the philanthropists. The State, however, has rendered great assistance, and in 1858 took over a school home, the Institute for the Blind, where the blind are taught and trained from infancy. This school began with 60 pupils, and now has about 150 pupils. To the grown-up blind, great assistance is rendered by various philanthropic associations and by the State. The number of cases of blindness has greatly decreased in Denmark. In 1911 there were only 500 or 600 blind people between 18 and 60 years of age.

The care of the deaf and dumb has, since 1807, been undertaken by the State. There were two institutes for the deaf and dumb in 1860, with room for 200 people, and in 1911 four institutions, with room for 400 people.[38]

The support of children of people without means in institutions for the blind, or for the deaf and dumb, is considered not actual poor relief.

Institutions for people with stuttering and other faults of speech.—The State in 1898 erected an institute where assistance is rendered to young people without means who have serious defects of speech.

Disabled and mutilated.—In taking care of the disabled and mutilated Danish charity, assisted by the State, has done so much good since 1872 that the erected institutions (clinic, school, home, and coast

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sanatorium) have been taken as models by various European countries. Help was rendered, in 1877, to 89 persons; in 1890, to 371; and, in 1911, to about 1,350 new patients.

Convalescents.—Only a single borough (Frederiksberg) has, during recent years, admitted hospital patients to country convalescent homes, but more recently private charity opened about 10 smaller homes, where 100 to 200 convalescents can be received, either free of charge or for a small payment. The accommodation is almost entirely planned for women. A philanthropic association assists, during the summer months, all convalescents who are not fully able to pay for both traveling expenses and the cost of a stay in the country.

Care of aged people not provided for by the pauper administration.—Until 1892 the care of aged people was completely in the hands of private charity, which supported a great number of old-age asylums, partly for needy persons, generally, and partly for people belonging to a specified industry or trade, and there are many bequests for the benefit of aged people inside or outside of institutions. This sort of private charity during 30 years continued to increase. In 1892 the State intervened with a law, which departed from the principle, namely "help to self-help," hitherto followed by the State and private charity in most directions, and allowed all respectable old people, who had not for a certain number of years (originally 10, now 5 years) obtained actual poor relief, a yearly sum, according to conditions, together with free medical treatment and medicine, treatment in an infirmary, etc., and, eventually, complete maintenance in an asylum for the aged. This humane law has become a heavy burden for the State and the communes, which share the expenses, for the old-age pensions have increased so much that over 10,000,000 kroner are now spent on 77,000 persons (about 57,000 were bread-winners and 20,000 dependents). About 36 per cent of all the women in the country above 60 years old, and about 20 per cent of all the men above 60 years of age, were partly or wholly maintained by the public. The expenses have increased from half a million to a million kroner yearly, and as the law does not encourage the people to put something by for old age the population is strongly tempted to evade moral responsibility as regards aged relatives (especially parents). A commission, appointed by the State in 1903, is now considering the possibility of returning to the principle "help to self-help," by the introduction of compulsory old-age insurance. A number of handsome and comfortable communal homes for the aged are already erected all over the country and new ones are built every year. Copenhagen has taken the lead by erecting a stately building where 450 to 500 weak or helpless old people (married couples are as far as possible not separated) are nursed and looked after. In 1910 about 1,000 people were maintained in all institutions for the aged.

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In Copenhagen private charity has commenced to establish small homes for aged single people (even if old-age pensioned); two lately formed associations[39] look after single persons by arranging evening meetings with entertainments, excursions to the woods, the placing of the old people for one or two days in well-to-do families in the country, or for a longer period in a colony in the country, and in other ways.

VII. Measures Against Infectious and Venereal Diseases.

Puerperal fever occupies a special position, and a number of regulations of midwives for the repression of this fever have already been mentioned. (See diagram 4.) Measures against the other serious infectious diseases were, during the first half of this period, considerably hampered by the insufficiency of old enactments. In consequence of the radical change in scientific opinion concerning the nature and mode of transmission of these diseases considerable changes have been made in the laws of different countries, and amendments were also made in Denmark in the eighties.

The usefulness of these measures depends in the first instance on (*a*) the quick detection of the germs of an epidemic, and the rapidity with which it is reported (the population must have ready access to medical aid, and be inclined to use this aid); (*b*) that the detected cases are isolated as quickly as possible. Since only a small portion of the population can afford to carry out isolation at home, this again implies that the necessary places for isolation are at hand, and also that the patients are, in general, willing to submit to this isolation, so that powers of compulsory removal are not often resorted to; (*c*) that after the patient has been removed to the hospital a thorough disinfection takes place as soon as possible. This requires cooperation on the part of the family, who should understand the nature of the process, and should show honesty and thoroughness, so that nothing infected is hid away or withheld; also reliability on the part of that person who has charge of the disinfection. Measures against epidemic diseases are dependent within the limits prescribed by scientific knowledge and the practical conditions prevalent in the infected homes; further, upon cooperation between the medical profession and the laity, possessing certain moral and intellectual qualities, the nonexistence of which renders null and void the best enactments in force against infectious diseases. When we take this into account, the intelligence of the people, the easy access to medical aid,[40] the population's confidence in the medical profession, we may expect good results from the measures against infectious diseases as practiced in Denmark.

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The decrease of typhoid fever may be taken as a result of the measures against this disease, together with the systematic researches and investigations of the typhoid bacillus, which have been conducted during recent years by the serum institute. The general development of hygiene must also be taken into account.

Smallpox.—We may now give some information concerning the spread of smallpox since 1890.[41] Animal vaccine is used against this disease. The vaccine has been prepared at the State vaccine establishment, and vaccination has been compulsory since 1810. By an act of 1871 all children are required to be vaccinated when they

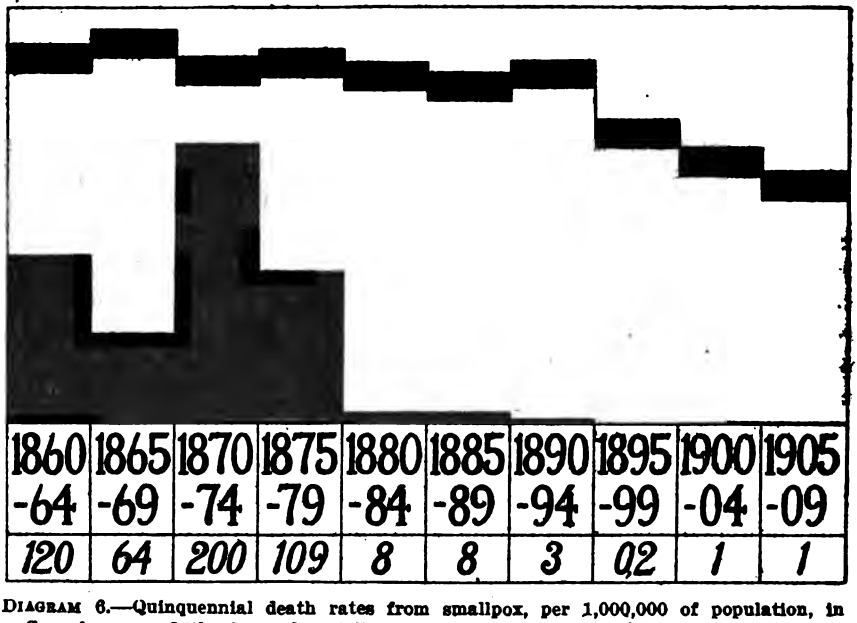

DIAGRAM 6.—Quinquennial death rates from smallpox, per 1,000,000 of population, in Copenhagen and the boroughs of Denmark, from 1860 to 1909. The upper part of the diagram shows the total death rates (all causes) for the entire Kingdom, by five-year periods, from 1860 to 1909.

are about 7 years old, before they are sent to school, and all conscripts to the army are likewise required to be revaccinated; and in cases of epidemics compulsory vaccination is directed by the authorities.

The vaccination is performed by official physicians at the expense of the Government. In Denmark the frequency of the disease has decreased considerably during this period. (See diagram 6, showing the death rate from smallpox for 1,000,000 of the city population.)

The morbidity and mortality from smallpox among the country population is much smaller than that of the city population. This disease has never appeared epidemically in Denmark, but is always

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imported into the country and nearly always through the seaport cities. During 1890–1909 only small outbreaks appeared (24 deaths in the boroughs and 7 in the rural districts spread over 20 years).

Although the Kingdom's communication with other countries has increased greatly, both by ship and by rail, and although Copenhagen, during the last 10 years, has experienced a considerable invasion of pauper Russian Jews, and although the country has received numerous Polish agricultural laborers,[42] all these foreign elements raising the likelihood of importing infection, nevertheless, during 20 years only 9 small epidemics have appeared (from 10 to 100 cases), while 20 to 30 sporadic cases of smallpox (not counting cases put ashore from passing ships) were promptly discovered and isolated without spreading infection, and at least 10 epidemics were smothered in birth. All this, together with the fact that such a large seaport as Copenhagen, during 10 years (1896–1905), has not had a single case of smallpox of local origin, proves how energetically the fight against infectious diseases is conducted in Denmark by the cooperation of an enlightened population with a law-abiding medical profession.[43]

Isolation.—It should be remarked that until 1880 isolation could be practiced only to a slight extent, outside of Copenhagen. During epidemics it was necessary to establish temporary hospitals in buildings intended for other use. Only a few hospitals in the provinces had special epidemic wards, and fewer still had special buildings for infectious diseases. A radical change in these conditions took place in the course of 10 or 15 years; in quick succession, new epidemic hospitals standing alone, and likewise new epidemic wards were established at existing hospitals. At the same time, disinfecting ovens of a new pattern were everywhere installed. The number of beds for infectious diseases at the disposal of the Kingdom rose from 300 or 400 beds in 1880 to 3,150 beds in 1910; and it is worthy of remark that this was well under way before the enactment, in 1888, of a law which authorized the communes to establish epidemic hospitals, assuring the inhabitants free treatment during epidemics, and brought the pressure of public opinion to bear on the communes to meet the increasing desire for hospital treatment. Two occurrences greatly hastened the development—the large diphtheria epidemic during 1886–1893 and the change which gradually took place in the public's views of hospitals. The active or passive resistance to hospital treatment which was predominant at the beginning of the period quite disappeared, and with the majority has changed to a strong preference for treatment at a hospital. Producers of milk, trades folk, and others have to consider the disturbance of business caused by keeping at home a patient suffering from an infectious disease.

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The results of our isolating measures appear in part from the graphic curves in diagram 7 and diagram 8, showing, respectively, the mortality for the town population from diphtheria and scarlatina. Statistics are corroborated by numerous and momentous declarations from country medical men, expressing it as their opinion that beyond the shadow of a doubt many an epidemic in the rural districts has been smothered by the prompt admittance to hospital of the first cases. Of the cases of diphtheria notified, some 70 per cent are now taken from home; of the scarlatina cases a smaller portion, owing to the slight malignancy of this disease.

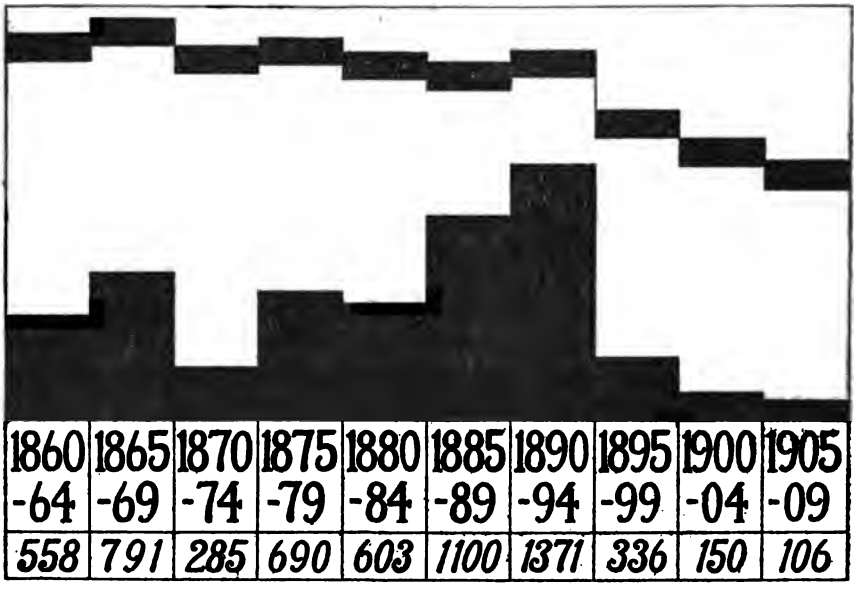

DIAGRAM 7.—Quinquennial death rates from diphtheria (including croup), per million of population, in Copenhagen and the boroughs of Denmark, from 1860 to 1909. The upper part of the diagram shows the total death rates (all causes) for the entire Kingdom, by five-year periods, from 1860 to 1909.

Diagnosis stations for diphtheria and typhoid fever.—During the last 10 years increasing use has been made of the bacteriological diagnosis in fighting diphtheria and typhoid fever, and 15 (1910) public diagnosing stations for diphtheria and typhoid are now in existence throughout the Kingdom, besides which a number of provincial hospitals make the bacteriological diagnosis.

Serum institute.—At the same time the theoretical study of the nature of infectious disease and the practical measures against epidemics have been advanced by the erection, in 1901, of the Serum Institute (Statens Seruminstitut),[44] which was originally intended for the preparation of therapeutic serums, but which has since been extended to clinical diagnostic examinations. As the director of the

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Serum Institute is an ex officio member of the State board of health (being its bacteriological and epidemiological consultant), and as this latter institution since its reorganization, in 1909, has taken a more active part in the fight against local epidemics throughout the Kingdom, the Serum Institute will naturally come to be a central institution for fighting infectious diseases, a development inevitable in a country where distances are small and means of communication highly developed.

Since 1911 the permanently appointed disinfectors can, at the expense of the provincial communes, take part in a course of training at the Copenhagen Disinfecting Institution.

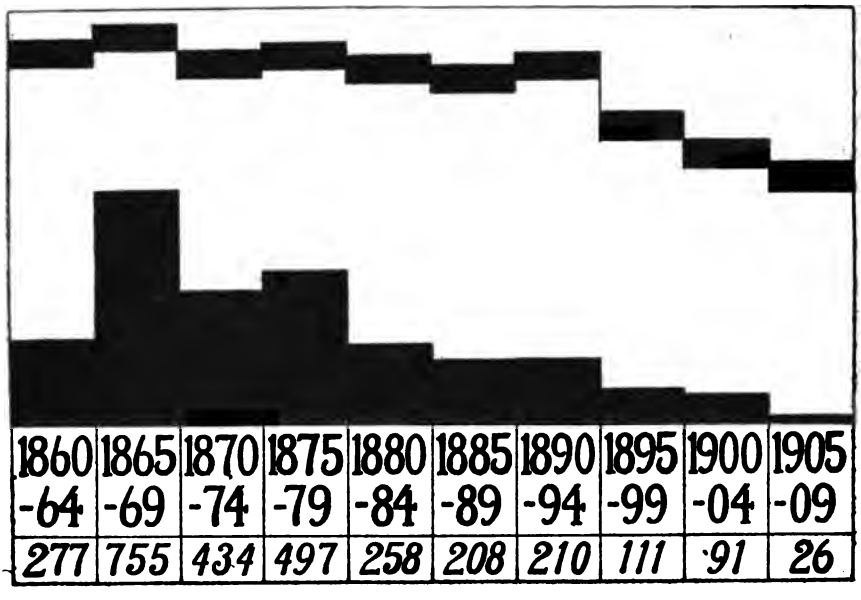

DIAGRAM 8.—Quinquennial death rates from scarlet fever, per million of population, in Copenhagen and the boroughs of Denmark, from 1860 to 1909. The upper part of the diagram shows the total death rates (all causes) for the entire Kingdom, by five-year periods, from 1860 to 1909.

Finally, it is worthy of note that, since 1907, measures have been taken, at the expense of the State and of the communes, to encourage the public to take part in the fight for exterminating rats.[45]

The venereal diseases, especially syphilis, have now, apart from the capital and several larger provincial towns, only an unimportant spread.[46] Formerly conditions were much less favorable, and it was attempted to combat these diseases partly by insuring to every sufferer from venereal diseases free treatment at a hospital, by special measures toward syphilitic nurse children, and for vaccination (before animal vaccine was adopted); by a code of instruction for midwives; by the medical examination of the conscripts;[47] and

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partly by maintaining a rigorously controlled prostitution in the metropolis and in several of the larger provincial towns. These measures were defined in a law enacted in 1874, which was in force for a long time. Soon, however, a private association was formed which, on ethical grounds, energetically advocated the abolition of legalized prostitution, and after medical opinion with regard to public prostitution had gradually undergone a great change public prostitution was abolished, first in the provincial towns by the communes, after which it disappeared from Copenhagen in consequence of a law enacted March 30, 1906. This law insures to every patient suffering from a venereal disease free treatment, as an out-patient or at a hospital, by the public medical officers or by the visiting doctors appointed by the communes. (At Copenhagen there are 12, of whom 2 are female doctors.) The patients are placed under a control which can amount to a restriction of civil rights. Similar control may be exercised over patients treated by private medical men. The rather extensive private prostitution in the capital is restrained by various police measures authorized by the law.

Various philanthropic institutions have for many years been working to rescue women from the ranks of public prostitution and to prevent access to private prostitution by taking charge of loose young women. The Guardian Councils (Vaergeraadene) undertake work of this sort. Of late years there has come into existence a private association for fighting against venereal diseases which works partly by spreading information regarding the importance of these diseases, partly by maintaining a nursing home for syphilitic infants. What influence the abolishment of public prostitution will have on the spread of venereal diseases it is as yet impossible to learn from statistics.

VIII. Measures Against Tuberculosis and Cancer.

Tuberculosis.—Whilst Denmark, at a comparatively early period, began to take measures against scrofula by building seaside hospitals and seaside sanatoria for children, measures against tuberculosis were taken up much later; though after being instituted the development was very fast indeed. (See Table 2.) This was due partly to the exertions of the Danish medical profession in enlightening the public as to the nature of tuberculosis and establishing the first tuberculosis sanatorium, partly to private philanthropy, which built the majority of all the curative establishments for tuberculosis, through the agency of the very active National Society for the Prevention of Tuberculosis, and partly by the Government by passing two acts in 1905, which are extensively discussed in the paper by Mr. A. Johansen.

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In Denmark there were, in 1900, only 1 sanatorium, 1 tuberculosis hospital, 1 seaside hospital, and 2 seaside sanatoria. At the close of 1911 there were 13 sanatoria, 24 tuberculosis hospitals recognized by the Government (or special wards or departments of the general hospitals for all the different stages of the disease),[48] 3 large seaside hospitals, 6 seaside sanatoria for children, and the Finsen Light-Cure Institute for the treatment of lupus, besides 13 diagnosis stations for tuberculosis for the free use of the physicians. In 1910 these institutions could accommodate 2,400 persons (the Finsen Light-Cure Institute not included), but when we include the country settlements for scrofulous children, the homes for adult tuberculosis patients, and

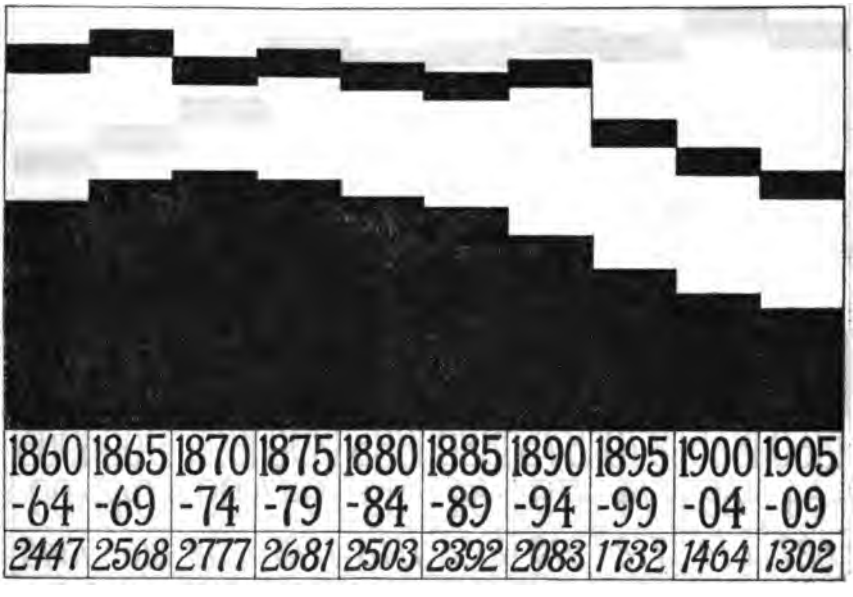

DIAGRAM 9.—Quinquennial death rates from tuberculosis of the lungs, per million of population, in Copenhagen and the boroughs of Denmark, from 1860 to 1909. The upper part of the diagram shows the total death rates (all causes) for the entire Kingdom, by five-year periods, from 1860 to 1909.

the tuberculosis wards in the provincial hospitals, there are accommodations for about 3,000 patients, or about 11 for every 1,000 population.

Denmark, in the course of 10 years, has taken a place among the foremost countries with regard to the care of the tuberculous. Sanatoria are no longer being built, tuberculosis hospitals being preferred, also homes for patients affected with that disease.[49] That most useful work which is now being performed at the dispensary for tuberculous patients in Copenhagen will, according to the amended tuberculosis act of 1912, be considerably extended by grants from the municipality and from the Government. It is also expected that this

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act will lead to the establishment of similar institutions in the provincial cities. The dispensary which has been established on similar lines to those in France, besides rendering aid, also tries to prevent infection from tuberculous patients in their homes by providing other homes for the healthy children. This plan is carried out on a large scale.

Diagram 9 shows the decrease in the death rate among the city population in Denmark from tuberculosis of the lungs.

Although it is probable that economic progress is one of the causes of the decrease in the death rate, there can be no doubt that

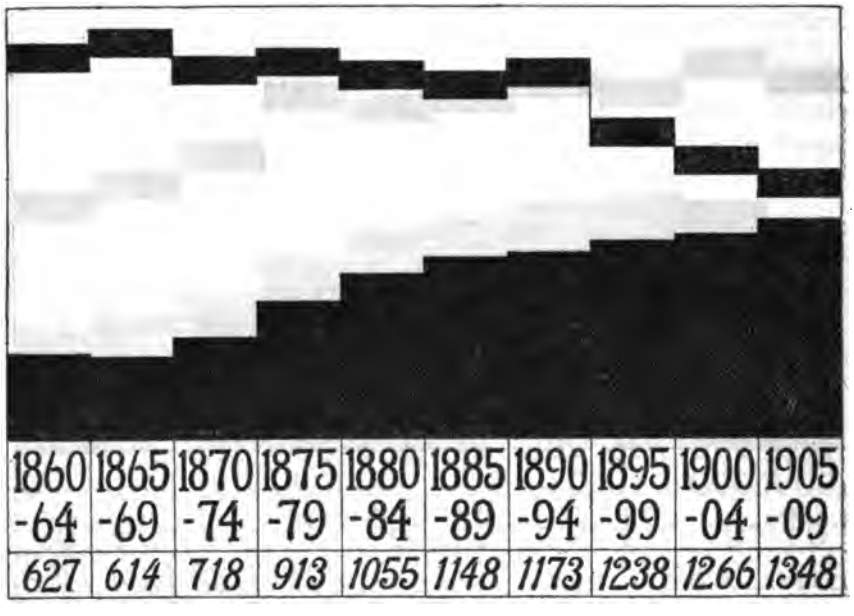

DIAGRAM 10.—Quinquennial death rates from cancer, per million of population, in Copenhagen and the boroughs of Denmark, from 1860 to 1909. The upper part of the diagram shows the total death rates (all causes) for the entire Kingdom, by five-year periods, from 1860 to 1909.

the numerous and expensive measures against the disease which have been employed during the last 10 years have played a prominent part, and in the next 10 years their results will be yet more striking.

Cancer.—Diagram 10 shows the increasing spread of cancer.

It must, however, be pointed out that the enormous increase in the death rate of this disease in reality is not so appalling as shown by diagram 10. It must be borne in mind that the diagnosis "cancer" as the cause of death is now much better than formerly, because the very extensive use of the hospitals permits more precise diagnosis. It can not be denied that the death rate from cancer is in-

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creasing in this country, as is the case in many other European countries,[50] and we know nothing of the cause of this increase. The diagram shows that in spite of the decrease in the total death rate, and regardless of the fact that the power of resistance of the population as a whole has increased, the death rate from cancer is increasing, so that the contrast between this disease and tuberculosis is very striking.

The Danish medical profession several years ago called attention to this phenomenon. The profession has appointed a cancer committee, which has spread the knowledge of the nature of this disease, encouraging the use of surgical aid at the earliest possible stage of the disease, making full examination of the tissue of tumors, and collecting information as to the local development of the disease. Special measures against cancer have not been taken. Private philanthropy in 1912 subscribed to the formation of a radium fund for Denmark, so that people soon will be able to have the same possibilities of cure or betterment from certain cancerous diseases which people in other countries of civilization have had.

IX. Disposal of the Dead.

During the whole period the rule has been followed that no corpse can be buried before an inquest has been held, either by a physician or by the lay coroners. Since 1871, all corpses in the boroughs and the country districts, within a radius of 2 kilometers from a physician's home, must be inspected by physicians. Whilst at the beginning of the period only a small percentage of the dead from the country population was inspected by physicians, the figures for 1910 showed 54 per cent. This great increase, which is of the utmost importance for the mortality statistics of the country, is of course a result of the great increase in the number of country physicians. But there are other causes; for instance, the fact that a yearly increasing number of the country population find it discreditable not to have a post-mortem examination of their deceased performed by qualified practitioners, instead of by lay coroners. Post-mortem examination by physicians of nearly all the deceased in the country districts, which the population has taken up voluntarily, will in a generation be prevalent practice, if not compulsory.[51]

The new epidemic act of 1888 required the making of a regulation concerning the manner in which corpses are to be dealt with until interment. Since 1905, all physicians and coroners must report every death resulting from tuberculosis of the lungs (larynx) to the subcommittee for measures against epidemic diseases, on account of a possible disinfection.

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Of great importance is the change which has been effected with regard to burials from homes. It becomes more and more usual to have the interment take place direct from the mortuaries at the hospitals, or at the cemeteries. This is partly because of the increasing number of deaths at the hospitals, and partly because it becomes customary among people to have the body removed from home to a mortuary. In the boroughs, the mortuaries are always at the cemeteries, and the expense which arises from the use of these mortuaries is now more easily met, because the people are better off. Here the insurance principle has also been made use of by the formation of burial aid societies, often in connection with medical aid societies.[52] In Copenhagen, the number of those buried from homes was, in 1889, about 36 per cent of the interments of the year. (This includes a considerable number of corpses which were conveyed to cemeteries in other towns, to be buried there.) Of these 36 per cent, the majority were bodies of small children. In 1911, the number of burials from homes only amounted to 14 per cent of all interments. This figure may, however, be somewhat diminished by taking into account the number of deaths which have occurred at private clinics, so that in reality only a few adults and a few hundred children, out of about 7,500 interments in 1911, were buried from homes. In the provincial towns a development of the same kind has taken place. In the country districts the greater part of the burials take place from homes; but in proportion as the hospitals increase and mortuaries are built at the cemeteries, there is a marked decrease in the number of home burials. In the few deaths from infectious diseases in homes, and the consequent burial from home (a few deaths resulting from typhoid fever and several deaths from diphtheria), it is a rule in the cities that all sociability in connection with the burial is avoided.

The cemeteries, which have been planned and supervised by competent officials, and which are managed according to certain regulations, have a history of 20 years. The minimal depth of graves is fixed by law at 2 meters. The depth of earth above the coffin is as a rule fixed at 1.25 meters (in the municipal regulations), and only in special cases of less depth (down to 1 meter). There has as yet been no valid reason to believe that the cemeteries have contributed to the spreading of contagion. Cremation was permitted by an act of January 4, 1892. In Copenhagen there is a private crematorium, which the municipality will take over; also two societies on the insurance principle for people who desire to be cremated. The use of the crematorium is gradually increasing; in 1911, 138 corpses were cremated.

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X. Concluding Remarks.

From the foregoing it will be seen that the Danish people, during this period, have passed through a great economic and intellectual development which, especially during the latter half of the period, has ranked the country among the foremost nations with regard to public hygiene, and in certain respects (measures against pauperism, measures against epidemic diseases and tuberculosis, hospital administration, medical-aid societies, and sick nursing) conferred upon the country a very high standing in comparison with other civilized nations.

This progress has been effected, more often at the initiative of the medical profession than by the Government, and the well-educated population has followed the directions given; so that the State, with regard to such matters as infectious diseases and the support of the aged, has promoted the passing of special enactments, and with regard to many other important matters the State has confined itself to offering grants and to the encouragement of private and communal measures.

How great a part hygienic progress plays, with respect to improvement of the public health, compared with that which is due to better conditions of living, can not be decided; there is, however, no doubt about the fact that it is very great. It is a matter of doubt whether the methods hitherto employed for strengthening the health of the people will be of any avail against the degenerative phenomena which have appeared in this as well as in other civilized countries, such phenomena as the decreasing birth rate, the increasing number of weak children and abnormal persons whose vitality is now extended by humane measures, the increasing mortality from cancer and certain constitutional diseases, the growing desire for enjoyment of life, together with the diversion from a natural mode of living, a mode strengthening for body and soul. It will remain for future generations to create an institution for hygienic self-knowledge and self-culture, which possibly will be able to prescribe new courses, and to arrest the degeneration of the races.

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[1] A part of this decrease—but only a small part of it—may be accounted for in the decrease in the birth rate which has taken place in this country as in other European countries.

[2] That part of the population which is engaged in agriculture has, from 1860 to 1901, increased from 727,000 to 972,000, whilst the industrial population has increased from 346,000 to 690,000.

[3] Only the population of the city of Copenhagen itself. Suburbs and neighboring townships not included.

[4] It is not, however, absolutely certain that this change is the only or the especial reason.

[5] 1 krone=100 Øre; 90 Øre=1 shilling. The depreciation of money must be taken into account in the figures named.

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[6] Since 1888, 8 savings bank subsidy from th d since 1881 a 2 and 10 Øre.) years this b amongst school about 13,000,000 kroner

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[23] In 1910 an office was opened by the municipality in Copenhagen for procuring work for the unemployed, and for directing unemployed persons to the places where work was to be had.

[24] The last-named institution, however, only with respect to the smaller concerns. In the case of the larger concerns, the expense of insurance and compensation lies exclusively with the employer.

[25] The workman receives compensation, but the employer is not compelled to have the employee insured.

[26] Insurance is obligatory for the employer.

[27] Enacted Jan. 24, 1899; Apr. 22, 1904; Apr. 10, 1909. During the years 1900–01 and 1910–11 the Government has granted loans to the amount of 25,000,000 kroner for the starting of 5,777 freehold cottage lots. In 1905 there were about 77,000 freehold farmers and larger estates, about 183,0000 houses with lots belonging to them, and about 30,000 houses without lots.

[28] In Copenhagen the number of school children provided with a hot meal daily for several months, the food being cooked at the schoolhouse, was as follows: In 1881, 484 children; in 1890, about 5,000 children; in 1900, about 7,000 children; in 1909, about 10,000 children.

[29] Much money is given away privately to persons begging, and large amounts, especially in the country districts, are given away in the shape of food and clothing. Of these amounts only a small part has been compiled statistically. The same may be said of the widespread unseen charitableness and the work performed by the numerous clubs and societies for mutual support. (Societies of 100 members, the Odd Fellows, and the Free Masons, and similar institutions.)

[30] As, for instance, by our law of 1874, which forbade the use of the poisonous phosphorous matches in Denmark.

[31] Law of March 10, 1852, on certain offensive trades; several regulations in the laws on building in 1856–1858; and the law of April 19, 1843, on the sale of poison (especially sec. 6).

[32] In 1908 a law was passed limiting all work on water, gas, electricity works, sewers, etc., to such persons as are licensed by the communal authorities. At Copenhagen such a regulation has been in force during the whole period.

[33] In connection herewith it may be remarked that Denmark's veterinary organisation has a very high standing, it being the first country that at the close of the eighteenth century followed France's lead in erecting a veterinary school. Among its teachers there are at present men with an international reputation among veterinary scientists. The number of veterinary surgeons was, in 1850, about 150; in 1890, about 470; in 1911, about 600.

[34] In this are included all health institutions for tuberculous people, but not infirmaries belonging to institutions for the feeble-minded and lunatics, nor prisons, nor military infirmaries, whose number of beds, in 1910, amounted to about 1,100, nor private infirmaries and health institutions, which the great majority of people can not afford to patronize.

[35] For the year 1900 it has been calculated that a supply of 66 beds for each 10,000 inhabitants, which supply was to be found in Germany, with all its Krankenanstalten, was the highest number which until then had been reached in any country (Centralblatt f. allg. Gesundheitspflege, 1905, p. 75, according to Hygienische Rundschau, 1905, p. 679).

[36] Of these, 300 were deaconesses trained at the Protestant institution (Diakonissestiftelsen) established in 1863, which carries on a large philanthropic work.

[37] During recent years a beginning has been made in two of the lunatic asylums to use family nursing.

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[37] Law about the arrangement of institutions for imbeciles (1902); law about the erection in Ribe of a State institution for imbeciles (1905).

[38] A philanthropic association maintains, since 1869, a working house for 36 deaf and dumb girls, together with a lately erected asylum for 30 deaf and dumb people.

[39] The one, however, is only a new department in a philanthropic religious institution, Københavns samvirkende Menighedsplejer, which has existed for a number of years.

[40] Besides the above-mentioned information concerning medical aid societies, a great number of polyclinics for persons in need have, for several years, been established in Copenhagen and in some of the largest boroughs in the Provinces. The number of persons applying for medical aid at these polyclinics is very large and is constantly increasing.

[41] See Report of the State Board of Health of Denmark for 1909, Copenhagen, 1912.

[42] These conditions, and especially the arrangement of immigrants' lodging houses (Faellesboliger) are under public control according to the law of Aug. 21, 1908. It is in consequence of the great invasion of Poles (about 10,000 in 1911) that a post as epidemic doctor was created in 1909 at Gedser, the first Danish port for traffic from the south.

[43] Danish medical men do not, as is the case in England, receive any payment for their notifications of infectious diseases.

[44] By law of Mar. 20, 1901. Institute extended later by law of Apr. 1, 1910.

[45] Law of Mar. 22, 1907, and law of Apr. 18, 1910, which is valid for 5 years.

[46] The medical men are obliged to notify in their weekly returns the number of cases treated by them, classified by age and sex, of the three forms of syphilis (*S. acquisita, e coit. impur., S. a. insons, S. congenita*), and of venereal ulcer and gonorrhea. The statistics collected in this manner are very imperfect, except, perhaps, as regards *S. congenita*, of which something over 100 cases per annum are notified for the whole Kingdom, about half of them from Copenhagen.

[47] Regulations in the criminal code fixing severe punishment for those who, while conscious of suffering from such a disease, spread infection to others.

[48] The Government gives subvention to the building of tuberculosis hospitals, also in detached buildings or special wards or departments of the general hospitals, according to the plans of the buildings which are to be approved by the Government. The Government grant includes also a considerable amount for maintenance, so that the payment rendered by private patients here, as well as at all other tuberculosis hospitals which have Government support, is reduced to a very small amount, and may be altogether dispensed with for persons without means (not actual poor relief).

[49] The National Society expects to receive the necessary money through national collections covering the whole country, which are made once a year on a special day called the "Autumnal flower day."

[50] There is no doubt about the fact that diabetes mellitus also in many European countries, including Denmark, has increased greatly.

[51] In case of death from accident or suicide, when corpses have been found, or when there is a suspicion of crime, and on other like occasions, the inquest is held, everywhere in the country, by an official coroner and a medical official. In 1910, about 1,600 inquests of that kind were held.

[52] By an act of Apr. 1, 1905, the Government has taken over the supervision of the many existing burial aid funds, and has offered grants in order to further their cooperation by reinsurance. At the beginning of 1911 there were about 1,100 funds, with about 370,000 members, of which the greater part belonged to burial aid funds connected with medical aid societies.

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LEGISLATIVE AND ADMINISTRATIVE ASPECTS OF PUBLIC HEALTH ENGINEERING.

A. BJERRE, Secretary to the City Engineer, Copenhagen.

DISPOSAL OF SEWAGE.

Denmark, which consists of a peninsula and several islands, has a coast line of great extent and, as the great majority of the larger towns are situated near the coast, most of the sewage is discharged directly into the sea. Denmark has, however, advanced legislation on this subject. As an agricultural country, attention has early been directed to the disposal of injurious water.

The Danish law of 1683 mentions rivers and streams, and the regulations of 1758, 1759, and 1760 make more important provisions concerning the cooperation of landowners.

The regulations of 1790, with the first definite rules for disposal of injurious water, were issued with the betterment of agriculture in view.

The regulations of 1846 and the acts of 1851 and 1859 further improve the rules in consequence of important advances in agriculture during the first half of the nineteenth century. Since that time the legislation on this question may be deemed very good.

The principles in this legislation were public control by local committees, called "water surveys" or "water boards," and cooperation by the landowners in cleaning and keeping up existing streams and channels and in procuring new channels or ditches.

As a landed property might be kept down in value by stubborn neighbors declining to give passage for the water, it was most important that these regulations give the right to an owner when necessary to discharge injurious water, at his own expense, across the neighbor's land. This neighbor might be required to share the expense if the project was deemed by the board to be useful for the neighbor's land also.

The act of May 28, 1880, contains all the former rules, remodeled and amended, and it also gives rules concerning the use of water, for instance, for irrigation.

All these regulations, originally meant to serve the purpose of draining the fields, were later used for the procuring of sewers.

The act of April 23, 1897, amendment to act of May 28, 1880, concerns the pollution of rivers and watercourses.

If sewage or other waste from farms, mills, manufactories, dairies, slaughterhouses, and so forth, are carried into watercourses, increasing the work of cleaning, occasioning overflow, or involving other damage, the injured owners may bring the case before the water board.

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In giving judgment, the board has to fix the compensation to the plaintiffs and to decide who shall pay it, and whether once for all or by yearly payment.

The act of April 19, 1907, amending the act of May 28, 1880, gives the special rules for the disposal of sewage. The rules are, briefly, as follows:

When a landowner, in order to discharge the sewage from his property, thinks it necessary to carry a sewer, open or closed, across another owner's land, or wishes to carry sewage to an existing watercourse, he must lay the case before a water board consisting of a chairman and two members, all elected by the borough council. The board tries to bring about an agreement. If it does not succeed it may give judgment, with the consent of all parties concerned. Otherwise the case must be brought before the superior water board (agricultural board), which consists of the local judge as chairman and two members appointed by the ministry for home affairs and commonly selected from among the county councilors. Usually the borough council is summoned, as the cases are generally of public interest.

The same procedure is employed if a borough council thinks it necessary that new lines be laid to public sewers or open channels, or if the council thinks it desirable to plan a new system of sewers for larger areas, already built upon, or likely to be built upon in the near future.

In this last case each owner from whose land the sewage ought to be carried by the proposed new system may be summoned and may be required to share in the expense.

Before giving judgment, the board has first to decide whether the project ought to be advanced at all, and, next, whether the tax on an owner is proportionate to the gain to his property. If the plan is believed to be of common interest to the community the board may lay a tax on the borough. The board may also decide that a project is, for the time, to be carried out in part only.

The board fixes compensation for all damage involved in carrying out the work, making allowance for any profit to the property affected.

When the case is raised by the council, or the work is undertaken by the council, the council advances the money, including compensations, and makes known to all the owners interested the amount of their shares. The council has the same security for these payments as for the borough rates. By parceling out the properties the shares, if not paid in cash, may be divided among the plots according to their size.

Besides the common board and the superior board there is also a board of appeal, which is very seldom used. Actual work can not

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begin before the end of the time allowed for appeal. These rules are now 5 years old and have proved satisfactory.

In towns or suburbs it is very important that the sewers shall be well planned and carefully built. Private owners generally can not come to an agreement about payment, and the municipality refuses to take the matter in hand until security is given for the repayment of money advanced.

To let the town pay for the sewers would not be right, for sewers develop the land into building sites, and therefore ought to be assessed on the landowners and not on the rate payers, who would be compelled to pay twice, since they must pay higher prices for land upon which to build their houses.

The following briefly describes the procedure in a sewer case raised by the municipality:

The plans are prepared under the direction of the municipality and are then laid before the common water board. All persons interested are summoned. They may be represented at the meeting by their lawyers. Ordinarily there is only one meeting for this board, for an agreement is not likely to be obtained, and the case therefore goes to the superior board. The superior board generally engages a technical adviser who has no connection with the municipality concerned. The plan is thoroughly criticised with regard to the size of the area, amount of water, size and site of sewers, pumping stations, and outlets. A meeting is held, where the plan is explained to the owners and discussed with them. Before closing the meeting the time is fixed for a subsequent meeting, when the owners may bring forward oral or written objections to the plan. For instance, some owners may wish to build more, others less, than is proposed in the plan. Some do not wish to join at all, some will not pay so much as is stipulated, and some may present a claim to get the sewer free of charge.

After having heard the municipality, all the questions are considered by the board, and perhaps the plan is altered. Then a new meeting is held, with continued discussions and attempts to reach an agreement.

Even when decisions of the board are required on certain points, in the main the cases often are closed by common agreement. Ever since the law went into effect, five years ago, the boards and their advisers have made a point of obtaining this result. It must not, however, be understood that it is possible always to satisfy all the parties. It is more usual that common agreement is reached when a case comes to a point where all the persons interested are equally dissatisfied.

As provided by the act, the municipality advances the money and carries out the works. A part of the expenditure, commonly one-

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tenth to one-fifth, is assessed directly upon the community. The community assessment may be higher in cases where public roads send water to the sewers or if a pumping station, with the object of pumping the sewage out into the sea, is deemed to be of common interest to the community by preventing pollution of the coast.

The rest of the expenditure has to be paid back by the owners, and its just distribution is the most important part of the business. Commonly the area has to be divided into districts, in such a way that the owners are on nearly the same terms with regard to the manner of discharge, for instance, with or without lifting the water, or with or without open channels for storm water. For each of these districts the share in the payment has to be determined according to the amount of water, the way of discharge, and length of the sewers or channels required.

The different ways of taxing the owners within each of the districts has been studied very closely since the act was put in force. A consideration of this matter would lead too far. It is enough to say that the different boards and their advisers have been steadily approaching the conclusion that owners ought to pay according to the value of their properties (house and site), and that payment should not be required before the site is built upon.[1]

In order to determine the size of the tax it is necessary to estimate the final value of the properties in the district and how long a time it will take to build the district; the last, on account of the loss of interest, arising from the payment not falling due before the erection of the houses.

The rules of taxing the owners might possibly be fixed by legislation, but experience has shown circumstances so different in the different cases that it is fortunate that the boards are not bound always to use the same rules. By some variation, according to local circumstances and habits, the system of taxation may be so adjusted as to work the least possible inconvenience to the owners.

The city of Copenhagen has its own rules concerning sewers. The act of November 30, 1857, gives the rules for compulsory purchase of land for the construction of sewers.

The act of December 14, 1857, concerning streets and sewers, gives, in section 13, the following rules:

> When outside the ramparts, the proper discharge of sewage from buildings or sites can not be procured without passing over other properties, the municipality may, after having heard the owners of these properties, settle how the sewage has to be carried to a public sewer. The municipality also has to decide who is to construct the new sewer, who shall pay for it, when it shall be finished, who shall maintain it, and what compensation must be paid.

These rules have not been used very much. The main sewers were at that time constructed and paid for by the municipality, and the

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owners commonly came to an agreement upon the smaller secondary sewers.

Later on views were altered. The owners had to pay for the main sewers, too, and difficulties arose. As the community, by purchasing land, grew into a great landowner and became interested in the development of building ground, the arbitrary rules exercised by one of the parties interested were quite impracticable. After much trouble the rules were altered.

The act of April 28, 1906, amending the acts of November 30, 1857, and December 14, 1857, puts the matter in the hands of a commission, the chairman of which (a judge) is appointed by the King, while two of the members are appointed by the minister for home affairs and two by the court of appeal. The rules of the act come near to the rules of the above-mentioned act of April 19, 1907, for the country outside the metropolis. The taxes upon the owners have to be deteremined in proportion to the benefit to and increase of the value of the properties supposed to be served by the sewers. If the sewers are judged to be in some way of common interest to the community, the commission may make the advance of the case dependent upon the payment of a certain part of the expenditure by the municipality. In contrast to the rules for the country, this can be done only by consent of the municipality. In some cases, after the passage of the sewer act, agreements have been arranged between the municipality and the owners without using the sewer commission.

Septic tanks.—In 1902 the biological treatment of sewage was introduced in Denmark by the construction of the first septic tank with contact beds. Since then several installations (the largest for a population of 35,000) with contact beds, as well as with sprinkling filters, have come into operation, but no official rules concerning such complete biological installations have been worked out.

The septic tank had a great vogue. In a few years the name got quite a magic value. All kinds of trouble in matters of sewerage were overcome by the words "septic tank," and a lot of tanks were built in all sizes, all sorts of material, and in all possible places, except, fortunately, inside the houses. Most of these tanks were what we call "house tanks"; that is, tanks for single houses.

In 1904 a suburban borough formulated some common rules concerning installations of septic tanks with the special view of introducing water-closets. The drawings must be sanctioned by the local sanitary committee, who also gives a certificate when the work is finished. Only in special cases were filters required. The small tanks take the waste water from water-closets and kitchens, but not that from bath or wash tubs, nor the rain water. Tanks must be placed outside the house at a distance of at least 2 feet, and at least 5 feet from a neighbor's land. The tank must have air-tight man-

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hole covers and a 1-inch pipe leading the sewer gas above the top of the roof. The material may be bricks in cement or concrete, at least 5 inches thick, and the inside be covered with asphalt; the bottom at least 12 inches thick, sloping 1 in 15 to cylindrical chambers for gathering the sludge. The depth of water in small tanks must be 6 feet. The capacity of the small tanks must be 15 cubic feet for each dwelling in the house, no tank being less than 3 feet in diameter. Larger tanks, also carrying rain water, require a volume of 20 cubic feet for each dwelling. The inlets and outlets must be submerged, respectively, 1½ feet and 1 foot below the water level. When rain water is sent to the tank there must be a chamber at the inlet to the tank, with a storm-water overflow coming into operation when the effluent amounts to 2 cubic feet per dwelling per hour, and so constructed that the flow to the tank will not exceed 4 cubic feet per dwelling per hour. Normally the rain-water flow is counted at 1½ cubic feet per second per acre when the whole area is covered with water-tight material (roofs, yards, and roads), and three-fourths cubic foot per second for macadam roads. When filters are used their construction must be approved by the local sanitary committee. Finally, some rules were made concerning contact beds.

It was not very easy to point out the dangers to health in the use of these house tanks. Nevertheless, people interested in public health did not like them, especially not in urban and suburban districts. The cleaning of the tanks might be troublesome, and obviously the system was a foe to the improvement of old and bad sewers. The hygienists opened a campaign against septic tanks for single houses, and the borough which first legalized the house tanks has spent a lot of money to improve the sewers, thereby making the small septic tank superfluous. Still, many a house tank is built in Denmark, with or without permission of the local authorities, and years will pass before the last house tank has gone out of use.

Regulations concerning house drainage.—The Englishmen, who have been the constructors of our first gas works, waterworks, and sewers, have also been our teachers in the science of house drainage, and it may be said that we have been very good pupils.

Copenhagen, especially, has profited by this learning. Since the building by-law of 1889 was put in force the department of streets and sewers has exercised control of all installations for the discharge of waste water from houses. Rules were worked out, and in 1895 very detailed regulations were issued. Since the water-closet system was generally introduced some 15 years ago the sanitary outfitting of the houses in Copenhagen has become nearly perfect, not in a luxurious way, but from a hygienic point of view. All the details, every connection between two pipes, from the sewer in the street to

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the top of the roof, are inspected, and the whole system tested when finished. No city in the world can have a better control of this matter.

The latest regulations for Copenhagen are of 1912. Their main feature is the disuse of the "interceptor." More praiseworthy is the discontinuance of the kitchen gulley trap with catch pit.

Also, outside the metropolis, most of the Danish town councils have formulated rules, more or less detailed, concerning house drainage, and especially the installation of water-closets. Some of these regulations are defective. Partly on this account and partly to procure regulations in districts which have no regulations, the Danish Society of Civil Engineers has appointed a commission of engineers and sanitarians to propose model regulations. To this end regulations from America, England, and Germany have been closely studied, and the new Danish regulations were presented to our National Health Congress in August, 1912. Among other things, these regulations are expected to help in doing away with the small house tanks.

WATER SUPPLY.

The Danish soil, which consists of a mixture of gravel and clay, is a good filtering medium. The common well, therefore, gives good drinking water, filtered by sinking through the soil. Such wells were for a long time the only water supply for the towns. In 1578 Copenhagen got the first wooden pipe, carrying in water from a high-level lake near the city.

During the following centuries the water supply for the city changed little by little from the well to a supply of surface water, taken from the lakes in the vicinity of the city up to a distance of 10 miles.

In 1859 the first waterworks were started on this surface water, all the water passing through sand filters before being distributed in the city. To meet the growing demand, it was tried to increase the amount of water by boring along the water channels and lakes, and in some places the water rose from a depth of 150 feet to 20 feet above the surface. In 1903 all surface water was abandoned, and the whole water supply of Copenhagen thereafter consisted of water from such artesian borings. Since 1900 all the water has been carried to the city in covered conduits. Now almost all waterworks in Denmark furnish water taken from a depth of from 100 to 200 feet. This water pours out, limpid, free from germs, with a fine taste, and an equable temperature summer and winter (8–9° Cel.; 45–50° F.). The only drawback is a content of iron, which often necessitates oxidizing and filtering the water.

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Some of the first legislation on this matter concerns the protection of the open water sources and channels.

The act of November 30, 1857, concerning the protection of reservoirs and channels belonging to the Copenhagen waterworks (later on adopted for provincial towns), forbids any person to injure the wells, sources, channels, or reservoirs, under penalty of imprisonment, while unintentional injury is punished by pecuniary fine. Within 400 feet from lakes, reservoirs, or open water channels it is forbidden to deposit rubbish, manure, refuse from slaughterhouses, or to erect factories which would endanger health. Within 1,000 feet it is not allowed to deposit night soil without permission of the committee on waterworks. Discharge of waste water to the reservoirs, the channels, or to the intercepting ditches along the channels is prohibited; existing outlets may be removed at the expense of the waterworks.

Under the same date—November 30, 1857—a law was enacted concerning the supply to the city of Copenhagen from the new waterworks. Under this law the expenditure for the operation and upkeep of the waterworks and for the payment of interest was assessed yearly on the consumers according to the floor area of the houses, and was collected as part of the rates. For this payment one tap was allowed in the yard, one tap in the kitchen, and one in the bathroom for each family in the house. The price for each additional tap was $1.05 a year. The tax for water for industrial use was subject to regulations. Both the waterworks committee and the manufacturers had a right to claim the measurement of water by meter. The house installation and connection pipe were paid by the owner. The municipality (the city owned the waterworks) had the same security for the water rent as for other taxes.

Regulations made on June 28, 1859, concerning the Copenhagen waterworks, give specifications for the material and strength of pipes for house installations, which can be executed only by authorized fitters. As a rule, all taps must be of a self-closing type. Special directions are given concerning the calculation of water consumption in factories.

More than half a century has elapsed since these regulations were issued, and many additional rules have been introduced unofficially. Just now a proposal for new regulations is under consideration in which all these rules are collected. Detailed instructions are proposed concerning the installation in private houses and new rules concerning material, weight, and dimensions of pipes, concerning the use of galvanized pipes, etc.

The act of January 28, 1876, concerning rules for the use of water from municipal waterworks, allows some rules from the act of November 30, 1857 (Copenhagen), to be adopted in regulations for

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provincial towns, subject to ratification of the minister of home affairs.

After the great majority of Danish waterworks were based upon deep-ground water, the old rules, especially for Copenhagen, concerning the protection of surface-water supplies, were found too strict, as the lakes and channels were kept only as a reserve. On the other hand, some rules for the protection of deep-ground water were urgently required.

The act of April 24, 1896, concerning the protection of water supplies, gives the following new rules: When the waterworks committee refuses permission to carry waste water to intercepting ditches along the channels belonging to the waterworks the minister of home affairs has to decide the matter and to state the conditions, if any, under which the ditches may be used. When works of construction, required according to the protecting act of November 30, 1857, cause any damages to landowners the waterworks committee has to pay full compensation. These rules may be transferred to communities outside the metropolis.

Drainage of waste water through bore holes to underground water, used for water supply, may be prohibited by the waterworks committee if deemed to be dangerous by two experts appointed by the local court, but the waterworks committee has to pay a compensation stipulated by the experts. These rules are enforced by penalties.

The act of April 23, 1897, on the use of land for the construction of covered water conduits, gives the right to carry municipal works of construction across private grounds when establishing new or improving old water conduits. Full compensation must be paid in Copenhagen, after the rules in the act of November 30, 1857, concerning the use of land for sewers; outside Copenhagen after the same rules, modified by the minister of home affairs. Instead of the valuation committee provided for in the Copenhagen law, the commission outside Copenhagen, consists of two members appointed by the minister of home affairs and two members appointed (in the rural districts) by the county council or (in the provincial towns) by the county governor.

From the above-mentioned acts it will appear that Danish legislation has in view, mostly, the protection of the water against enemies from without. In some cases, however, the dangers come from within, the waterworks being constructed by ignorant persons. The Danish Sanitary Association, therefore, is considering regulations concerning State control over the construction and operation of smaller private waterworks.

Administration of waterworks: The waterworks in Copenhagen and in most of the provincial towns (of which about 90 per cent now have central water supply) are owned and administered by the corpo-

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rations. In the country many small waterworks have been established in later years, the number being about one-quarter of the whole number of the rural districts in Denmark, some of the districts, however, having more than one waterworks. The majority of rural waterworks are established by cooperation, sometimes under municipal guaranty. Cooperation is very common among Danish farmers, who, for many years, have been used to copartnership in dairies, slaughterhouses, and the like. Many of the small waterworks in the rural districts are driven by wind power.

Concerning the payment for water, different systems are used. In Copenhagen, as above mentioned, the minimum water rent is proportionate to the floor area and provides for a yard tap, kitchen taps, and hot and cold water bathroom taps, while the price of each extra tap is $1.05 a year. For each flush closet, or each seat in a trough closet, the tax is $2.60 a year, for which price about 6,600 gallons[2] are allowed every half year, water exceeding this amount being charged at 30 cents per 1,000 gallons. Factories pay 7 cents per 1,000 gallons,[2] and for motive power and watering the price is 11 cents per 1,000 gallons.[2]

In the provincial towns water tax is proportionate to the insurance of the houses. For instance, a tax of $1 a year is equivalent to an insured sum of $400; $8.20 a year to $10,000 of insured value, according to a decreasing scale. This sum is paid for the first tap. Additional service costs $1.05 for each extra tap, $2.60 for each water-closet. Factories pay 10 cents per 1,000 gallons[2] by meter. Sometimes a special tax is paid on flats, proportionate to the rent.

In rural districts, with cooperative waterworks, the partners are generally taxed according to mutual agreement; for instance, a price per tap, and additional payment, proportionate to the number of cattle; in some cases 25 cents a year for horses more than 1 year old, and for cows more than 2 years old; less for smaller cattle.

MISCELLANEOUS.

The act of January 23, 1903, on the right of executing works concerning water, gas, electricity, sewers, and house drainage, empowers the governments of towns and rural districts to decide that no person may undertake any work in these lines without being authorized by the municipality. The authorization may be withdrawn if the work is not properly executed or if the regulations are not followed. When the water, gas, or electric works concerned are private, the owners have a right to ask for authorization. The authorizations and withdrawals are published in the local papers. State departments which have engineers in their service may be authorized, by the minister of home affairs, to carry out the different works mentioned.

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In Copenhagen examinations have for many years been held for persons wishing to be authorized to execute water, gas, and electric works.

Local sanitary by-laws are issued by the local authorities in most of the Danish towns and districts. The by-laws differ considerably, but they generally give rules concerning cleaning of roads and gutters, the collection and removal of refuse, discharge of waste water, construction and protection of wells, installation of water-closets and latrines, and arrangement of dunghills.

Concerning wells, the by-laws, since the sixties, have empowered the sanitary committee to inspect wells and to require suspicious water to be examined. If found to be dangerous to health, directions are given to the owner to remove the defects. The use of the wells may be prohibited.

In later years many of the by-laws have been strengthened with detailed rules concerning the installation of water-closets in flats, for instance, according to the size of the room, the construction of floor and walls, and ventilation.

In industrial districts the by-laws generally contain rules on smoke. If smoke, either by quantity or by nature, is a nuisance, the sanitary committee is empowered to require the owner, within a stated time, to abate the nuisance. In general the criminal courts must decide whether there is a nuisance; but in Copenhagen the question of nuisance is decided "according to the judgment of the sanitary committee."

The dangers which may arise from gas heaters are dealt with in the new sanitary by-law for Copenhagen. It is not desirable to lead the outlet pipes for combustion products from gas heaters to the chimneys, the draft being too great, or on account of the large water content in the combustion products, or for fear of chemical processes. It is noticed that if the outlet pipe is led through the outer wall to the open air, when the wind is on the wall the combustion products will not only be kept in the room but the flames may be blown out. This last has happened several times with gas heating in bathrooms, and the occupant, being unconscious of the presence of gas in the room, has in some cases perished.

According to the new rules proposed, outlet pipes are not required when the gas is supplied by a 3-light meter and when the room can be aired. In all other cases the gas heater must have an outlet pipe of sheet iron, with a diameter $4\frac{1}{2}$ times the diameter of the supply pipe, and must lead directly through the house to a height of about $1\frac{1}{2}$ feet above the top of the roof.

It is also proposed that any person selling or installing gas heaters must provide placards, printed in Danish, to be placed in the room

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with the heater, one giving directions for the use of the stove and another giving precautions concerning the use of gas for heating. The second placard is provided free of charge at the office of the sanitary committee.

[1] Extract of a water board judgment:

"* * * The community pays one-fifth of the expenditure and advances the whole outlay.

"Builded properties pay during 10 years, every quarter day, 1 per mille of the value of the property.

"Unbuilded properties pay during 10 years, every quarter day, 1½ per mille of the value of the property.

"All properties on the sewer area pay by erection of new buildings, by adding to existing buildings, or by rebuilding, in cash, 3 per cent of the increase in the value of the property. * * *"

[2] American gallon.

INSTITUTIONS OF SANITARY ADMINISTRATION OF JAPAN.

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SECTION I. INSTITUTIONS OF CENTRAL SANITARY ADMINISTRATION—ACCESSORY INSTITUTIONS.

CENTRAL SANITARY BUREAU.

Before the year 1875 the administration of public sanitation was in the hands of the minister for education, but during that year it was transferred to the minister for home affairs, and since then the central sanitary administration has been and is in the hands of the central sanitary bureau, which was newly established in the department for home affairs during that year.

The central sanitary bureau of the department for home affairs is divided into the three sections of health preservation, epidemic prevention, and medical affairs. The health preservation section supervises matters relating to waterworks, sewerage, sweeping and cleaning, parks, health resorts, mineral springs, foods and drinks, utensils used in eating and drinking, paints, pigments, etc.; the epidemic prevention section superintends matters relating to the prevention of infectious and local diseases, quarantine work, vaccine lymph, sera, and vaccination; while the medical affairs section superintends matters relating to physicians, pharmacists, midwives, nurses, treatment of medicines, pharmacopœia, and local hospitals.

The provided officials of the central sanitary bureau consist of 1 director (of Chokunin rank,[1] expert (of Sonin rank),[2] and 16 subordinates and assistant experts (of Hannin rank).[3] Besides, one of the counselors of the home department serves in this bureau. More-

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over, there are 2 sanitary inspection managers (of Sonin rank), and 2 assistant experts (of Hannin rank), for the management of epidemic prevention work. In addition to all these, there are 6 experts and managers (both Kennin).[4]

HYGIENIC LABORATORIES.

The hygienic laboratories were founded in 1874, when a Shiyakujo (medicine supervising place) was established in Tokyo, Kyoto, Osaka, Yokohama, Nagasaki, and elsewhere, for the purpose of examining the quality of medicines and also of supplying pure medicines. At present there are hygienic laboratories in three places—Tokyo, Osaka, and Yokohama; and, under the direct control of the minister for home affairs, these laboratories supervise examinations and investigations necessary for sanitary administration; while, at the same time, at the request of the general public, they perform chemical experiments on air, water, soil, clothes, food and drink, pigments, and mineral waters, as well as look into police, judicial, and medical matters; they examine the quality of medicines and manufacture and sell opium for medical use. Fees charged differ according to the nature of the examinations. According to the laws and ordinances of our country, medicines are allowed to be sold at large only if they are in conformity with any pharmacopeia, though not examined at the hygienic laboratories. But as physicians and others are more inclined to use those medicines which have been examined and certified at the hygienic laboratories, such examination and certification are being applied even in the case of imported medicines. Since medicines thus examined are more credited by the public, their prices always seem to be higher than the prices of those not examined.

The provided number of officials for the three hygienic laboratories are, in all, 9 experts (of Sonin rank), and 32 assistant experts and clerks (of Hannin rank).

INSTITUTE FOR THE RESEARCH OF INFECTIOUS DISEASES.

Originally the Institute for the Research of Infectious Diseases was a private affair, belonging to the Japan Private Sanitary Association, though receiving a subsidy from the Government; but, in 1899, it was made a regular governmental institution, being placed under the control of the minister for home affairs. The purpose of the institution is the investigation of the causes, the prevention, and the cure of infectious and other diseases, as well as in the preparation and distribution of vaccine lymph, sera, and bacteriological prophylactics and therapeutics. Again, at the request of anybody, examina-

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tion is made of any article used for preventive, disinfecting, and curative purposes. The institution also offers to licensed physicians and veterinarians a three months' course in the method of investigating infectious and contagious diseases. There are 1,601 of these medical men who have finished the course (including those who studied at the institution before it was made governmental) and are now serving either directly or indirectly in the prevention of infectious and contagious diseases.

Originally the manufacture of sera was the work of the institution before it became governmental—that is, while it belonged to the Japan Private Sanitary Association. In 1896 the Serum Institute was established for the purpose of manufacturing diphtheria serum, and, under the direct control of the home minister, it used to prepare and distribute the serum; but, in 1905, the Serum Institute was abolished and its work was transferred to the Institute for the Research of Infectious Diseases. At present, besides diphtheria serum, tetanus serum, tuberculin, typhoid-fever serum, dysentery serum, cholera serum, pest serum, trimeresurus-riukiuanus serum, streptococcus serum, and erysipelas therapeutic fluid, are being prepared and sold to physicians, pharmacists, and druggists, at their request. Typhoid therapeutic fluid, dysentery therapeutic fluid, cholera prophylactic fluid, and pest prophylactic fluid are distributed to the metropolitan police board, prefectural governments, the administrative government of Formosa, and other Government offices, at their request, or to cities, towns, villages, public or private schools, hospitals, and factories, at fixed prices, in case their request is sanctioned by the prefectural government. In the case of these sera and fluids being demanded from foreign countries, their request is complied with, provided no inconvenience is felt at home by doing so.

The manufacture of vaccine lymph was originally a work of the Government, but was afterwards made a private business. But the lymph produced was thought to be rather inferior in quality, though its price was not low; so that, in 1896, the work was again made governmental. At first both Tokyo and Osaka had each its vaccine farm, but the one at Osaka was abolished and the one at Tokyo was meeting the demand of the whole country. In 1905, however, that institution, too, was incorporated with the Institute for the Research of Infectious Diseases.

As the result of the pains and the investigations of the authorities concerned the convenient method of preparing vaccine lymph by the use of calves, instead of human bodies, and that for any number of successive inoculations was discovered, and thus the price of vaccine lymph was so much reduced that any person may obtain vaccine

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lymph at the rate of 5 sen a tube (one tube contains vaccine lymph sufficient for five persons), only half the price being charged for what is sold to cities, towns, and villages for public vaccination. For what is demanded from China and Korea the price is 10 sen a tube, while for what is demanded from other foreign countries 30 sen a tube, nothing being charged for transportation in either case.

The officials of the Institute for the Research of Infectious Diseases comprise 1 director of Chokunin rank, 7 experts of Sonin rank, 23 assistant experts and clerks of Hannin rank, and less than 20 non-paid assistant experts.

CENTRAL CONSULTATIVE BOARD OF HEALTH.

The Central Consultative Board of Health was established in 1879, and its official organization has experienced repeated amendments until the present one was passed by the Imperial Ordinance No. 57 of 1895. The institution is under the control of the home minister, and, with regard to public health, as well as the health of animals, replies to inquiries made by the minister of any department, or, upon a decision of the board, may offer advices to the minister of any department concerned.

The board consists, besides 1 chairman and 1 secretary, of not more than 28 members in all, including officials of the Imperial household department, the home department, the army department, the navy department, and the department of agriculture and commerce, the director of the Institute for the Research of Infectious Diseases, the dean of the medical college of the Tokyo Imperial University, and private medical and pharmaceutical scholars, as well as experts of sanitary works. Whenever any special problems present themselves persons having learning or experience therein may be temporarily added as members.

BOARD FOR THE INVESTIGATION OF THE JAPANESE PHARMACOPEIA.

In 1900 the board for the investigation of the Japanese Pharmacopeia was established temporarily for the purpose of examining and revising the second edition of the Japanese Pharmacopeia, which was accomplished, and the third edition was published in 1906. But as the investigation of the pharmacopeia was found indispensable at any time, the institution was made a permanent one. The board is under the control of the home minister, and its officials comprise, besides 1 director and 1 secretary, a committee consisting of not more than 16 medical and pharmaceutical scholars, whether in the service of the Government or not.

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Section II. Institutions of Local Sanitary Administration.

PREFECTURAL GOVERNMENTS AND THE METROPOLITAN POLICE BOARD.

Local sanitary administration is under the supervision of the minister for home affairs, in the hands of prefectural governors (in Tokyo Prefecture sanitary police affairs are in the hands of the metropolitan police inspector general), and belongs to the sanitary section of the police department of the prefectural government (at the metropolitan police board to its third department). The work of the police department consists in the supervision of police affairs, as well as of sanitary affairs, and is under the control of its chief (of Sonin rank), who in turn acts under the direction of the prefectural governor. In the third department of the metropolitan police board the work is under the control of the Sonin chief physician. The sanitary section is composed of a few police inspectors and assistant experts (of Hannin rank). In some prefectures, besides the above officials, experts (of Sonin rank) are provided.

Such is the provision for local sanitary administration under ordinary circumstances. But whenever any infectious or contagious disease prevails or threatens to prevail, epidemic inspectors or an epidemic inspection committee may be temporarily established at any prefectural government (in Tokyo Prefecture at the metropolitan police board) for the prevention of the disease.

In each of the four prefectural governments of Kanagawa, Hyogo, Nagasaki, and Fukuoka, the port affairs department is established for the management of port affairs and sanitary inspection of the ports of Yokohama, Kobe, Nagasaki, Kuchinotsu, Moji, Shimonoseki, and Wakamatsu, and port quarantine stations are annexed to the department. In addition to the general administration of port affairs it performs sanitary inspection of ships coming from foreign ports or from Formosa. Under the direction of the port warden (one of the prefectural commissioners acts as such), port-affairs managers (of Sonin rank), port physicians, and port veterinarians (all of Sonin rank), port officers, assistant port physicians, pharmacists, and subordinates (all of Hannin rank), as well as epidemic inspection committee and epidemic inspection physicians (all treated as of Hannin rank), perform their respective duties.

If it is found necessary to enforce sanitary inspection against ships coming from foreign ports, or from Formosa, at any port other than those mentioned above, a temporary port quarantine station is to be established. Under the direction of the prefectural governor concerned, the chief of the police department is to become the director of such station, and a certain number of Hannin officials of the prefectural government its officials. These, together with a certain

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number of assistant inspectors and assistant physicians (all of Hannin rank), are to manage the affairs. At present temporary port quarantine stations exist at the five ports of Hakodate of Hokkaido, Karatsu and Suminoe of Saga Prefecture, Kagoshima of Kagoshima Prefecture, and Nawa of Okinawa Prefecture.

DISTRICT OFFICES, POLICE STATIONS, AND POLICE SUBSTATIONS.

Under the prefectural government there are Gunyakusho or district offices (in Hokkaido-Cho there are Shi-cho or branch governments). In each district office the head of the gun or district (of Sonin rank, and, in Hokkaido-Cho, the Sonin head of the branch government), helped by district clerks (of Hannin rank, and, in Hokkaido-Cho, by Hannin subordinates) and employees, manage the affairs.

Besides, in each district or each city, there are a police station and police substations (in a large city often there is a police station in each ward, so that these police stations have nothing to do with the boundaries of the district of a city). The head of each police station (who in generally a Sonin police inspector in a city, but, in a district, a Hannin police sergeant) with a few police sergeants and numerous policemen under him, discharge their respective duties concerning police and sanitary affairs.

CITIES, TOWNS, AND VILLAGES.

Besides prefectural governments and district offices, there are cities, towns, and villages. Cities are under the control of the prefectural governor. Under the direction of the head of the city and its council board, its sanitary section or sanitary committee is established. Towns and villages are under the control of the head of the district, and, under the direction of the head of the town or village, its sanitary committee is established, while in each case a certain number of officials manage sanitary affairs of the city, town, or village. In each of the three cities of Tokyo, Kyoto, and Osaka there is a certain number of wards, and the heads of these wards share in the sanitary administration of their respective cities.

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[1] Officials of Chokunin rank are those appointed by the Emperor.

[2] Officials of Sonin rank are those appointed with the Emperor's approval.

[3] Officials of Hannin rank are those appointed at the discretion of the chief official.

[4] Kennin means holding another office in addition to the chief one already held.

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FEDERAL PUBLIC HEALTH ADMINISTRATION, ITS DEVELOPMENT AND PRESENT STATUS IN THE UNITED STATES.

Dr. J. W. KERR, Assistant Surgeon General, United States Public Health Service.

The jurisdiction of the Federal Government in public health matters extends over foreign intercourse, interstate intercourse, Federal territory, and Federal administrative affairs, including protection of the Indian tribes.

FEDERAL HEALTH ADMINISTRATION IN RELATION TO FOREIGN INTERCOURSE.

Federal health administration had for its fundamental object the prevention of the introduction of pestilential diseases. As long ago as May 27, 1796, a national law authorized the President to direct the revenue officers and revenue cutters to aid in the execution of quarantine, and also in the execution of the health laws of the States. As a further means of aiding foreign commerce, provisions were made, in successive navigation laws, to promote the health and comfort of passengers at sea, and, in 1798, provision was also made for the care and treatment of persons employed in the merchant marine.

Foreign and insular quarantine.—The necessity of more and more complete Federal supervision over international traffic was made apparent by repeated epidemics. The first permanent quarantine law, passed April 29, 1878, was a result of the widespread and severe epidemic of yellow fever during the previous year. The passage of the law of February 15, 1893, was intimately associated with the outbreak of cholera in Europe in 1892, and the quarantine act of June 19, 1906, followed the epidemic of yellow fever in the Southern States in 1905. Under the above-mentioned laws and a few minor ones, there was finally developed the national system of quarantine as it exists to-day—a system the development of which occupied approximately 100 years.

All quarantine operations are conducted under the supervision of the Federal Government, and, with two or three exceptions, all stations are conducted by Federal officers. Under the above-mentioned laws, regulations have been issued which automatically become operative on the occurrence of outbreaks of infectious diseases. The necessity of the promulgation of quarantine against a particular foreign port is thus obviated.

Quarantine regulations prescribe the measures that shall be observed at foreign ports, at sea, and at domestic ports, to prevent the introduction of infectious diseases. In foreign ports these regulations are required by law to be enforced by American consular officers, and at certain ports medical officers of the United States Public Health Service are detailed by the President for duty in

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American consulates to issue bills of health to steamships, and to make reports on sanitary conditions and the prevalence of diseases. Among the ports where such medical officers are stationed may be mentioned Santiago, Chile; Callao, Peru; Guayaquil, Ecuador; Rio de Janeiro, Brazil; La Guaira, Venezuela; Habana, Cuba; Libau, Russia; Naples, Italy; Calcutta, India; Hongkong and Shanghai, China; and Yokohama, Japan. In order to facilitate the shipments of fruit, these officers are also on duty during certain seasons of the year in the ports of Central America and the West Indies.

Officers of vessels en route to the United States are required to observe specific regulations, to preserve health, and, in the event of outbreaks of disease abroad, to take precautions to prevent its spread.

On arrival at domestic ports from abroad, vessels are subject to quarantine inspection. The detailed requirements specified in quarantine regulations are not here described. Suffice it to say that they include the hygienic measures to be taken with vessel, cargo, crew, and passengers, to prevent infection from being carried ashore. The provisions of law relating to quarantine apply not only to the continental United States, but to its island territory, and its possessions.

International sanitation.—With the view to aiding commerce by the prevention of the spread of diseases, the Federal Government participates in the benefit derived from international sanitary agreements. It contributes annually to the support of this work, the Public Health Service conforms to the agreements entered into, and, through official channels, strives to perfect them. As a means to this end, representatives of the Public Health Service are assigned as delegates to international sanitary conferences.

Sanitary supervision of immigration.—A long series of immigration laws have been enacted between the periods March 20, 1819, and February 20, 1907, their general objects, from a hygienic standpoint, being the improvement of the health and comfort of arriving aliens, and the development of a stronger race in the United States.

The medical inspection of immigrants is a Federal function performed by Federal officers. Some of these inspections are made abroad. In addition, the ship's manifests are required to contain certain data respecting the physical and mental condition of each alien, and reports must be made by the ship's officers of all diseases, injuries, births, or deaths occurring during the voyage.

On arrival at domestic ports, all aliens are required to undergo medical inspection, and hospitals are maintained for those suffering with disease. The object of the medical supervision of immigration is to exclude the physically and mentally unfit, and especially the latter, who will endow their offspring with an unstable mentality, thereby bringing about the further increase of insanity in the United States.

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FEDERAL HEALTH ADMINISTRATION IN RELATION TO INTERSTATE INTERCOURSE.

The administrative procedures in international sanitation having been established and their further improvement assured the great public health problems of the Nation are now of an interstate and intrastate character.

The Federal public-health statutes are based upon or are carefully in accord with that clause of the Constitution which gives the right to Congress to regulate commerce between the States. On account of the far-reaching effect of interstate intercourse on our national life the field for public health activities on the part of the Federal Government is wide. But it must not be occupied in such manner as to usurp the power of the States or to impair the efficiency of State and local public-health authorities.

The first Federal statute relating to the public health provided that there should be cooperation between Federal and local authorities, and this principle has been recognized in all subsequent legislation and followed in its enforcement.

Quarantine and sanitation.—Under the quarantine act of February 15, 1893, the Secretary of the Treasury is authorized to issue regulations for the prevention of the spread of infectious and contagious diseases from one State to another where the regulations of the States are inadequate. These regulations may be enforced by State and local authorities, but the Federal Public Health Service is authorized to cooperate in their enforcement, and should the States fail or refuse, the President may adopt such measures as, in his judgment, shall be necessary.

The powers under the above-mentioned statutes are broad, and the extent of their enforcement by the Federal Government depends on the facilities provided, the necessities in each case, and the state of public opinion with respect to the advantages of sanitation. Examples of work of this character that may be mentioned are cooperative measures for the collection and examination of rodents to prevent plague, antityphoid campaigns in urban and rural districts, and sanitary surveys of interstate and international waters in relation to the prevention of the spread of typhoid fever. There are great possibilities of extending work of this character, and it is along these lines that Federal public-health work may be expected to advance.

There is necessity, not only of quarantine measures to prevent the spread of communicable diseases, but of sanitary measures to prevent their propagation. These include the sanitation of trains and vessels and the supplies used aboard, the regulation of conditions under which the employees of common carriers work, and the exclusion from transportation of dangerous or infected merchandise. The

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limitations of the Federal laws in this respect may be determined only by judicial interpretation.

The control of epidemics.—On account of the relation of epidemics to the hygienic and commercial welfare of the country, the Federal Public Health Service may, under the provisions of the above-mentioned law, assume responsibilities in respect to their control under the direction of the Secretary of the Treasury and the President. In the event of outbreaks of cholera, yellow fever, smallpox, plague, or typhus fever in any part of the United States the President is also authorized to cause sanitary regulations to be issued and enforced to prevent their spread, and an epidemic fund of approximately half a million dollars is appropriated annually for expenditures of the Federal Public Health Service in suppressing epidemics of these diseases.

It is under such authority that the epidemics of yellow fever in the Southern States, the outbreaks of plague in California and our island possessions, and similar outbreaks have been handled. In every instance, however, there has been thorough cooperation on the part of the Federal, State, and local authorities. The equity of our form of Government requires that the two latter shall exercise their police powers to the fullest extent, and it is on request of these authorities that the Federal Government goes to their assistance. This may be advisory in character or may assume a more active form.

When material aid is extended, the Government's funds are required to be expended by officers of the Federal Public Health Service, and these latter are therefore placed in charge, and have the cooperation of State and local officials as well as officers of the Federal Government.

The occurrence of epidemics affords opportunity for investigations of an epidemiologic character, and advantage is taken of such situations. As an example may be mentioned the studies of plague in California and typhus fever in Mexico City.

Control of biologic products in interstate traffic.—The dangers to the public health from the exploitation of contaminated or inert biologic products impelled Congress to pass the act of July 1, 1902, regulating the propagation and sale in interstate traffic of viruses, serums, toxins, and analogous products. By its provisions, licenses are issued to establishments to engage in such traffic. Prior to the issue of licenses, inspections are made of each establishment by officers of the United States Public Health Service, and examination is made of all products for which license is desired. These examinations are repeated from time to time, using samples obtained in the open market.

Under the law, regulations are issued governing inspections of establishments, examinations of their products, the issue of licenses,

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and the compliance with adopted standards of purity and potency. Samples accompanying each importation of any of the biologic products in question are required to be examined before release by customs officers. By this means only is it practicable to prevent the dissemination of those biologic products which may be the means of conveying infections that give rise to disease.

Supervision of foods and drugs.—In the interest of foreign commerce, meat products, prior to shipment abroad, have for some years been subject to inspection, and on June 30, 1906, provision was made by Congress to prevent the use, in interstate traffic, as well as in foreign traffic, of meat products which are unsound, unwholesome, or unfit for human food. The enforcement of these laws devolves upon the Bureau of Animal Industry of the Department of Agriculture. All establishments affected by the law are required to be inspected. The animals slaughtered, and the meat produced from them, are also subject to inspection, and regulations are prescribed for the sanitation of establishments engaged in the meat industry.

On June 30, 1906, there was also enacted by Congress the law to prevent the manufacture and sale, in interstate traffic, of impure foods and drugs. This law is enforced by the Secretary of Agriculture through the Bureau of Chemistry of that department.

COLLECTION AND COLLATION OF SANITARY INFORMATION.

The successful administration of public-health laws depends essentially upon a knowledge of the existence and current prevalence of communicable diseases, the conditions that favor their propagation and spread, and the measures that are required for their control.

Information is received by the Federal Public Health Service from American consuls throughout the world, regarding dangerous diseases that exist or are epidemic in foreign ports. For this purpose the telegraph is resorted to, and, in addition, reports are made weekly by mail. In addition, special reports are made of matters pertaining to hygiene in the respective foreign countries.

Of even greater importance to the health of the country are the collection and collation of sanitary information and reports regarding the prevalence of diseases and the occurrence of epidemics within the States. This work on the part of the Federal Government is carried on with the voluntary cooperation of State and local authorities.

Reports of births and deaths are compiled by the Census Bureau, and sanitary information and reports of the occurrence and prevalence of disease are collected and published by the United States Public Health Service.

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The extent to which notification of cases of sickness can be carried depends upon the facilities provided the Federal Public Health Service, and, primarily, upon the development of local health organization within the respective States. The difficulties encountered in the enforcement of notification of cases of diseases in the United States are not unlike those abroad, but, in overcoming them, there will be performed the most important duty in connection with the preservation of the public health.

INVESTIGATIONS OF MATTERS PERTAINING TO THE PUBLIC HEALTH.

Another important function of the Federal Government in relation to the public health, and perhaps the most important one, is the conduct of scientific investigations. By this means Federal administration in public-health matters is simplified and rendered more accurate, local authorities are likewise aided, and through them the people are benefited by being taught the degree of sanitary excellence that may be attained.

By an act of March 3, 1901, investigations of contagious and infectious diseases and matters pertaining to the public health were given definite status in law. Provision was made whereby laboratory investigations would be systematically carried on. Through this provision, and in connection with the enforcement of the quarantine laws, investigations have been made at Washington and in different parts of the country. In order to comply with the law, however, this work was carried on largely through the Hygienic Laboratory.

By an act of Congress, approved August 14, 1912, broader powers were conferred on the Public Health Service to "study and investigate the diseases of man and the conditions influencing the propagation and spread thereof, including sanitation and sewage, and the pollution, either directly or indirectly, of the navigable streams and lakes of the United States."

There is thus abundant authority for both laboratory and field investigations by the Public Health Service. As in the past, the investigations will be conducted by officers specially trained, and with such cooperation as State and local health authorities may be able to render. But, in order that the great needs of the country may be met, more men and more money must be provided, and the Public Health Service must have the active support of individuals, professional associations, and other organizations to be benefited.

Many highly important problems await solution. Among them may be mentioned the standardization of biologic and other therapeutic products, the determination of the conditions causing pellagra and certain other diseases, the extent of the migrations of tuberculous

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and other patients from one locality to another, the ascertainment of the influence of artificial illuminants on health, the determination of the relation of housing and other conditions to labor efficiency, and the prescribing of reasonable standards to control stream pollution.

Requests are received daily from all parts of the country for information regarding sanitary problems and their method of handling. They are an excellent indication of the amount and extent of work to be performed in the immediate future. In one section of the country the question of the pollution of streams is pressing for solution. In another it may be industrial accidents and poisoning. In another the question of the reduction of infant morbidity, and, in still another, the measures that must be taken to eradicate malaria or other communicable disease. Federal health administration involves a wise selection of the problems to be investigated and the securing of appropriations necessary to carry them on.

DISSEMINATION OF INFORMATION RELATING TO THE PUBLIC HEALTH.

Sanitary reports and statistics and the results of scientific investigations are of value only as they are made public and used. An important administrative measure, therefore, is the distribution of public-health literature and the presentation of public-health lectures and exhibits.

By these means the Federal Public Health Service has been able to disseminate a considerable amount of sanitary information and to participate in the educational propaganda.

Among the publications issued are the Hygienic Laboratory bulletins, bulletins of the Yellow Fever Institute, Public Health bulletins, the weekly Public Health Reports, and miscellaneous documents. The Hygienic Laboratory bulletins represent the results of scientific investigations conducted in the laboratory. The Public Health bulletins are more popular in character and are utilized to convey sanitary information to health officials and to the public generally. The weekly Public Health Reports are issued primarily for the benefit of health authorities as an aid in administration. Their utility is recognized throughout the world, and their improvement as contemplated will render them the most useful organs in health administration in this country.

The Public Health bulletins are to be further popularized and made of interest to individuals, and they should be distributed by millions. The recognition by the Secretary of the Treasury of the value of public health education, and his deep interest in sanitary administration generally, has been responsible for a material increase recently in the amount of public health literature issued and, indeed, in the amount of scientific and practical sanitary work performed.

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HEALTH ADMINISTRATION IN RELATION TO FEDERAL TERRITORY AND FEDERAL ADMINISTRATIVE AFFAIRS.

Administrative measures taken in the interest of international and interstate sanitation and the investigations conducted in relation thereto have a direct or indirect value in connection with Federal administration generally; but in Federal territory and in relation to Federal administrative affairs special provision is also made. The sanitation of the military forces is performed by their respective medical corps. Sanitary inspections of Government buildings and workshops, to control tuberculosis, devolves on the Public Health Service, and through cooperation it performs, under regulations, sanitary duties for other bureaus and departments. The extent to which this cooperation may be rendered depends upon the number of officers available, since the Comptroller of the Treasury has decided, in effect, that officers of the Public Health Service may undertake public health duties for other bureaus provided the expenses are borne by those bureaus. Under this provision, for instance, steps are being taken for the sanitary betterment of the Indians in Alaska, and inspections have been made of mines and the mining industry, with particular reference to lung diseases among miners and the measures necessary for their control.

ORGANIZATION OF THE FEDERAL PUBLIC HEALTH SERVICE.

The Federal Public Health Service is a bureau of the Treasury Department. Through successive acts of Congress it has undergone a process of evolution, so that all of its duties are essentially of a public health character, and it is organized with a view to their performance.

The central bureau at Washington, which is presided over by the Surgeon General, has seven divisions, as follows:

1. Personal and Accounts.
2. Foreign and Insular Quarantine and Immigration.
3. Domestic (Interstate) Quarantine and Sanitation.
4. Sanitary Reports and Statistics.
5. Scientific Research.
6. Marine Hospitals and Relief.
7. Miscellaneous.

Each of the six divisions first mentioned is in charge of an Assistant Surgeon General, who is directly responsible for administrative matters in connection with his division. In the absence of the Surgeon General the officer next in rank acts in his stead. This is the officer who has charge of the Division of Personnel and Accounts and who has immediate supervision of the entire personnel, the appropriations, and the preparation of the annual estimates therefor.

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Through the Division of Foreign and Insular Quarantine and Immigration are administered all matters relating to maritime quarantine and medical inspections of aliens. In the field this division is represented by 44 quarantine and inspection stations scattered along the several coasts in the continental United States, 25 insular stations, 37 stations located at foreign ports, and 83 immigration stations.

Through the Division of Interstate Quarantine are administered all matters relating to the control of contagious and infectious diseases in interstate traffic. In the field this division is represented by officers engaged in the inspection of Government buildings, suppression of plague outbreaks, and control of epidemics of typhoid fever and other diseases in cooperation with State and local authorities.

The Division of Sanitary Reports and Statistics handles all matters collected in relation to morbidity reports, reports of epidemics, the geographic distribution of diseases, and climate in relation to health and disease, and it prepares and publishes the weekly Public Health Reports and reprints therefrom. In the field it is represented by all American consuls at foreign ports and by officers of the service wherever stationed and depends on the voluntary cooperation of State and municipal authorities to forward reports.

The Division of Scientific Research administers all matters relating to investigations of contagious and infectious diseases and matters pertaining to the public health wherever made. In the field it is represented by the Hygienic Laboratory with its four divisions, the plague laboratory in San Francisco, the leprosy investigation station in Hawaii, the pellagra investigation station at Savannah, Ga., the station at Wilmington, N. C., for the investigation of the parasites of man, and by officers engaged in investigations of typhoid fever, Rocky Mountain spotted fever, poliomyelitis, and so forth, in different parts of the country and sanitary surveys of navigable waters wherever conducted.

In the Division of Marine Hospitals and Relief are administered all matters connected with the care and treatment of seamen and the recruiting for the several bureaus of the department. In the field it is represented by 22 marine hospitals and 121 relief stations.

In the Miscellaneous Division are handled all matters in relation to the care and distribution of publications and examinations of surfmen of the Life-Saving Service, and claims for disability in that service.

To-day the Public Health Service has a corps of approximately 420 medical officers, 50 pharmacists, and a total personnel of about 2,000.

Advisory conferences on administrative matters.—Under the Constitution and existing statutes the Federal Public Health Service

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is restrained from assuming duties that properly devolve upon State and municipal authorities. But their relations are so intimate that Congress has made provision not only for cooperation, but for conferences on public health matters. In the public-health law of July 1, 1902, provision is made for annual conferences between the Public Health Service and State boards and departments of health. Provision is also made for special conferences with all or a part of the State health organizations, and upon the application of not less than five State health authorities a special conference must be called. The deliberations pertain particularly to administrative measures. In effect, there is thus provided an advisory council on administrative matters, in which each State is entitled to representation, which, in its development, will insure cooperation and be an arbiter on vexed sanitary questions.

Advisory conferences on scientific matters.—In the above-mentioned law Congress also provided for an advisory board for consultation relative to the investigations to be inaugurated and the methods of making them in the Hygienic Laboratory. This board consists of nine members, four of whom are officers of the Government; the remaining five being scientists eminent in laboratory work and connected with the leading endowed institutions of the country. By this means the service is brought in touch with the great scientific laboratories and may avail itself of advice from the highest sources.

Congress has thus made provision for councils in respect to both administrative and scientific matters. Their utilization in the highest degree is one of the most important means of development of public-health organization and of public-health work.

The foundations have been laid for further development and for the performance of a greater amount of efficient sanitary work. In order that health administration shall be effective, however, it must be adequately supported by appropriations, and it is the securing of these and their wise expenditure that constitute efficient administration.

DISCUSSION.

Dr. Federico Torralbas, Habana, Cuba: I avail myself of the opportunity given to me for the discussion of the papers relating to public-health administration in different countries to present to you as briefly as I can the general outline of our sanitary organization. In the first place, I am proud to say that Cuba is the only country having a member of the cabinet as superior officer to supervise all matters of sanitation in the nation as a whole, in the provinces, and in the municipalities.

The secretary is assisted by two main bureaus—public health and charities, and a body named the superior board of health. The dif-

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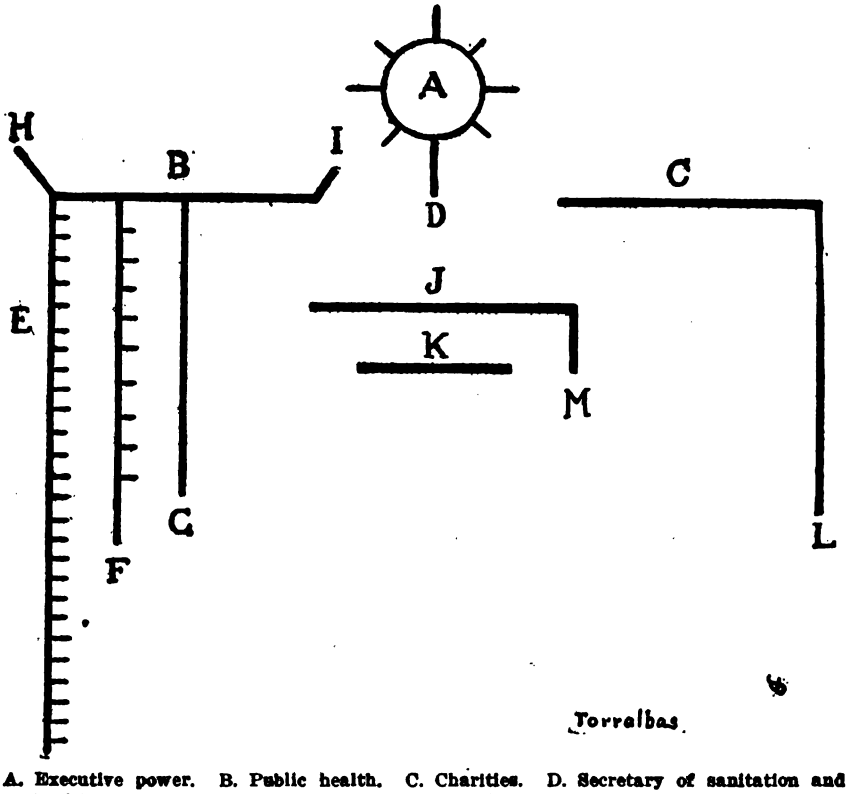
ferent phases of public welfare are represented. These include the University of Habana, the Academy of Sciences, the Antituberculosis League, the Society of Economic Studies, the Board to Regulate Prostitution, the Public Health Department, the Charity Department, lawyers, and engineers. The Commission for Infectious Diseases, which acts as the supreme body in the establishment of diagnoses of quarantinable and other infectious diseases, is also included. Furthermore, we have two laboratories: One devoted entirely to scientific investigations, the other dealing with the making of prophylactic and therapeutic serums, and the diagnosis of pathological specimens, such as the Widal reaction, tuberculosis, diphtheria, malaria, examination, and so forth. I will also inform you that the value of our organization was recently demonstrated in a recent outbreak of plague in Habana, which, as you know, was very quickly stopped.



A. Executive power. B. Public health. C. Charities. D. Secretary of sanitation and charities. E. Municipalities and provinces. F. Quarantine. G. Immigration. H. Research laboratory. I. Clinical laboratory. J. Superior board of health. K. Commission of infectious diseases. L. Hospitals and charitable institutions. M. Control of prostitution.

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JOINT SESSION OF SECTIONS I AND V, THURSDAY MORNING, SEPTEMBER 26, 1912.

EPIDEMIC POLIOMYELITIS IN NORWAY; ITS ETIOLOGY AND THE POSSIBILITIES OF ITS PREVENTION.

FRANCIS HARBITZ, Professor of Pathology to the University of Kristiania, Norway.[1]

I. HISTORY.

Acute poliomyelitis has been known in Norway for nearly a century, the first cases having been described in 1820. Reports on this disease, with more detailed descriptions, from the years 1842 and 1852, are on record.

The first authentic description of epidemic acute poliomyelitis was given in 1868 by Dr. Chr. Bull, as, we believe, the first description of the epidemic form of this disease ever undertaken. His report covered 14 cases with 5 deaths and the question of a "contagium vivum" was discussed.

In the eighties and nineties, new endemics of acute poliomyelitis were described, and in 1898, 3 cases—brothers and sisters—of which the one case was not fully developed (abortive), were thoroughly examined and reported on by Bülow-Hansen and Francis Harbitz, who declared that the disease was an acute infectious disease, and that the infection had its point of entrance through the throat and alimentary tract.

In 1899 an extensive epidemic broke out in one of the rural districts and was studied by Legaard, professor of neurology, who concluded that the disease spread, like other contagious and infectious diseases, along the roads of communication, and that the time of incubation was short—just a few days.

The following years only a few sporadic cases and local small endemics occurred. In the summer and fall of 1905 an epidemic broke out with 962 cases and a mortality of 10 per cent. The next year—1906—the disease again came to an outbreak, with 466 cases, and with the same percentage of mortality. These epidemics ravaged simultaneously different districts of the country and were closely studied and described by Geirsvold, Harbitz and Scheel,[2] and Leegaard, who all concluded that the disease is infectious and contagious during the first days or weeks, and that it could be spread through the medium of healthy individuals.

During the years 1907–1910 a few sporadic cases and small groups of cases occurred.

In 1911, however, the epidemic character of the disease was again in evidence; it now ravaged large tracts of the country and also districts where it never before had been known. There were this year about 1,250 cases, with a mortality of 8 to 10 per cent.

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II. GENERAL EPIDEMIOLOGY.

From the foregoing it will be seen that acute poliomyelitis has been prevalent in Norway for a great many years, cases of the disease having been traced back almost a century, and that epidemics have been recognized and described for about 45 years. The conclusion therefore seems justified that the virus of this disease has been constantly present in a latent condition, and under favorable circumstances has become active and spread itself over numerous districts.

It was, however, after the great epidemics of the last 15 years that the physicians of our country gave closer attention to the disease which now has been minutely studied by a number of Norwegian scientists, whose conclusions are as follows:

Epidemic poliomyelitis is an acute infectious as well as contagious disease.

The outbreak occurs at times suddenly and simultaneously in several districts. It frequently happens that the epidemic starts with cases here and there and to all appearance not connected with each other. At times it is evident that the disease starts from a local point and spreads, following the lines of communication, as the highways, railroads, along the coasts and fjords, by way of steamers and boats. This mode of infection is clear by outbreaks in isolated, sparsely inhabited places.

Again, comparatively small epidemics have had their starting point from a school, a country store, public meetings, and weddings, or can be traced to tramps, gipsies who have passed through the district, and lastly it has occurred as, we may term, local house epidemics, in which one member after the other in a family or household has been stricken with a few days' intermission, and that different degrees of the disease have developed, some terminating with death by Landry's paralysis, others again as the ordinary poliomyelitis with subsequent paralysis, and some which may be termed "abortive cases," with only slight symptoms, and of short duration, and, finally, some exposed individuals, who remained well. The abortive cases (Geirsvold) are of particular interest. They are characterized by a rapidly passing fever, pains in the back and limbs, stiffness of the neck, nausea and vomiting—symptoms resembling those of a severe cold or influenza.

Authentic cases of neuritis or encephalitis or transverse myelitis were not observed in connection with or during the epidemics of acute poliomyelitis.

The time of incubation is as a rule 1 to 3 days, sometimes longer, not infrequently 8 to 10 days. There is on record a case whose time of incubation must have been several weeks to 3 months—a prisoner in solitary confinement who was infected and got the disease. The infection is as a rule carried from one person to the other. Of great interest is the fact that light abortive cases are just as infectious

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as the more serious ones with pronounced symptoms, and it must be presumed that the contagion can be transmitted through apparently sound bacilli carriers who have had a latent infection for a shorter or longer period.

The mode of entrance is no doubt through the alimentary tract, and especially through the naso-pharynx. That the disease at times is eminently contagious is proved by the fact that several nurses who took care of acute poliomyelitis—patients in the municipal hospital of Christiania—got the disease and died.

As a rule, though, acute poliomyelitis does not seem to be markedly contagious; for this assumption speaks the fact that frequently only one member, for instance, a child, would be stricken, although this child had slept in the same bed with some of the other children who remained well, and, again, sporadic cases do occur in well-populated country districts, even in larger cities. At the same time, we must assume that the latent infection and lighter abortive cases have been more widely disseminated. For this assumption speaks the fact that a locality in which have been found some sporadic cases—small endemics—as a rule goes free the next year—seems to have been made immune.

There is no conclusive foundation for the belief that the contagion is carried through food or through animals. Suspicion has been directed toward dogs, cats, chickens, reindeer, "lemen" (migrating animals of the mouse tribe), but a more thorough investigation has disproved this theory.

In dry summers, during the more recent endemics, multitudes of insects have been observed—particularly flies—and the possibility of an indirect infection through insects can not be denied, but is not proved.

An unexplained and singular fact is that the epidemics break out in the summers and falls of certain years, but without reference to climatic conditions, while sporadic cases occur all the year around; further, that the disease is most prevalent in the rural districts, and, finally, that the epidemics differ from each other as far as contagion and malignancy are concerned. However, such is also the case with other contagious epidemics, as, for instance, contagious cerebro-spinal meningitis.

III. TREATMENT AND MEASURES AGAINST THE DISEASE.

The recognition of acute poliomyelitis as an infectious and contagious disease was very early established in the minds of the Norwegian physicians, and the chief medical officer of the national board of health in 1904 sent to all physicians of the country a circular declaring that acute poliomyelitis should be classed under the epidemic diseases demanding public control and, in a circular of August 28, 1905, he further specified the measures to be taken, namely:

1. Immediate notification to the board of every case, abortive cases included.

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2. Isolation of the sick.

3. Careful disposition of the patients' excretions and secretions, particularly from mouth and throat.

4. Thorough disinfection after termination of the disease.

5. Particular attention to the lighter abortive cases, and to the possibility of the disease being carried through the intermediary of healthy persons.

Norway is, we believe, the first country whose medical state department has taken measures against the disease.

These measures have had active cooperation from the local health boards of the infected districts; these boards have even at times taken more drastic measures by closing the schools and prohibiting public meetings as well as vaccination during the prevalence of the disease.

At times, these measures came too late—after the epidemic had spread—but reports from some of the infected localities show that the precautions helped to limit and stop the disease.

The treatment of the individual cases has been mainly symptomatic and possibly not of much avail.

Spinal puncture and aspiration of spinal fluid has been recommended and has acted favorably by relieving and lowering the cerebro-spinal pressure. Urotropin has been recommended because of its absorption into the spinal fluid after perhaps having undergone decomposition. This remedy is said to have given good results.

Prophylaxis in the way of repeated careful antiseptic gargles and sprays of mouth, nose, and throat have been advised.

Abortive cases and supposedly infected persons have been admonished to exercise particular care in avoiding exposure to cold and overexertion, which, experience has taught, can produce the disease with subsequent paralysis.

After treatment.—Massage seems to be of great value and should be persisted in for weeks and months and years, as the case may demand.

The State has examined into the crippled conditions which the disease has left in its wake. There is under consideration the question of how steps could be taken to give these patients massage, surgical, or orthopædic treatment at public expense.

The State has also inaugurated examinations to secure more light on the disease and its etiological factors, and has instituted experimental research for the purpose of a more thorough understanding of the modes of infection of acute poliomyelitis.

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[1] Read by Prof. Axel Holst.

[2] A short extract of their work was printed in the Journal of the American Medical Association, Oct. 26, 1907, pp. 1420–1425.

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AETIOLOGIE DER POLIOMYELITIS UND DIE MOGLICHKEIT IHRER VERHÜTUNG.

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Das wesentlichste aetiologische Ergebnis der in den letzten Jahren ausgeführten Untersuchungen über Poliomyelitis ist die schon durch die ersten Uebertragungen auf Affen gewonnene Erkenntnis, dass diese Erkrankung nicht, wie man vorher oft annahm, durch verschiedenartige, in der grauen Rückenmarksubstanz lokalisierte Entzündungserreger, sondern durch ein spezifisches, gut charakterisirtes Virus verursacht wird. (Landsteiner, Popper, Knöpfelmacher, Strauss, Flexner u. Lewis.)

Allerdings war es trotz zahlreicher Versuche niemals gelungen, mit Hilfe entzündungserregender Mikrobien bei Tieren Rückenmarksentzündungen zu erzeugen, die das pathologisch-histologische Bild der Poliomyelitis dargeboten hätten, aber ähnlich, wie bei anderen Infektionskrankheiten unbekannter Aetiologie wurden öfters und bis in die allerletzte Zeit positive Ergebnisse bakteriologischer Untersuchungen bei Poliomyelitis mitgeteilt, die im Ganzen zwar nicht übereinstimmten, aber innerhalb der Beobachtungsreihen einzelner Autoren selbst eine gewisse Konstanz zu haben schienen und wenn auch nicht beweisend, doch schwer klar zu widerlegen waren. Gegen die pathogene Bedeutung der Kokkenbefunde sprachen die Abwesenheit färbbarer Mikrobien in Gewebsschnitten und die durchaus negativen Resultate einer Anzahl von Untersuchungen; eine plausible Erklärung für die scheinbar positiven Resultate ergab sich später aus Beobachtungen von Leiner und von Wiesner, die zeigten, dass die ersten Anteile durch Punktion gewonnener Spinalflüssigkeiten gar nicht selten, wahrscheinlich aus der Haut stammende, bakterielle Verunreinigungen enthalten.

Die endgiltige Entscheidung der Frage wurde erzielt, als es gelang durch intraperitoneale Einspritzung von poliomyelitischem Mark Tiere zu infiziren und die Untersuchung des verimpften Materiales lehrte, dass keine mit den bekannten Färbungs- und Kulturmethoden nachweisbare Mikrobien darin enthalten waren. Dieser Befund, zusammen mit der Aehnlichkeit zwischen Poliomyelitis und Lyssa in Bezug auf die pathologischen Veränderungen musste schon bei den ersten Ergebnissen der Tierversuche den Gedanken nahe legen, dass der Erreger der spinalen Kinderlähmung unter den filtrirbaren Virusarten zu suchen sei.

Tatsächlich konnte ich und Levaditi meine Vermutung bestätigen und die Filtrirbarkeit des Virus durch verschiedenartige Filter (Berkefeld-, Reichel-, Pukall- und Chamberland-kerzen) nachweisen und sehr bald darauf berichteten Flexner und Lewis und Leiner und Wiesner über gleichartige Ergebnisse.

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Von den übrigen bisher bekannten Eigenschaften des Virus ist seine Resistenz gegen Glycerin als charakteristisch hervorzuheben und es ist beachtenswert, dass auch in diesem Punkte eine Uebereinstimmung mit dem Verhalten der Lyssaerreger und einigen anderen filtrirbaren Virusarten besteht. Aufbewahrung in Glycerin ist demgemäss ein gutes Mittel zur Konservirung des Infektionsstoffes. Eine Zerstörung des Virus durch Galle liess sich im Gegensatze zu dem Verhalten mancher filtrirbarer Mikrobien nicht nachweisen; das Verhalten gegen Saponin ist noch nicht geprüft worden. Die Resistenz gegen Phenol ist ziemlich beträchtlich.

Gegen Erwärmung ist das Poliomyelitisvirus empfindlich, so dass schon eine etwa halbstündige Erwärmung einer Markaufschwemmung auf 55 Grad ausreicht, um es abzutödten; bei mittlerer Temperatur (20 bis 27 Grad) bleibt es mehrere Tage lang wirksam, in gefrorenem Zustande lässt es sich eine Reihe von Monaten ohne Verlust der Virulenz aufbewahren.

Ein Umstand der für die Krankheitsverbreitung möglicherweise Wichtigkeit besitzt, ist die Haltbarkeit des trockenen Virus. Nach den vorliegenden Versuchen kann die Wirksamkeit bei gewöhnlicher Temperatur rasch getrockneten Materiales gewiss einen Monat lang, vielleicht beträchtlich länger erhalten bleiben. (Römer und Joseph u. A.)

Die Bemühungen, die Keime optisch darzustellen oder doch charakteristische Zelleinschlüsse in den erkrankten Geweben nachzuweisen, haben vorläufig noch nicht zu befriedigenden Resultaten geführt. Zwar hat Bonhoff bei Anwendung der Mann'schen Färbung Einschlüsse, besonders im Kerne der Gliazellen aufgefunden, aber es steht nicht fest, ob diesen Gebilden spezifische Bedeutung zukommt. Auch die Versuche Kulturen der Erreger zu erhalten, kann man nicht als geglückt ansehen. Flexner und Lewis, sowie Levaditi, sahen Trübungen entstehen, als sie Serumbouillon mit Virusfiltraten impften und von diesen Nährlösungen Subkulturen anzulegen versuchten; in den getrübten Flüssigkeiten waren bei Dunkelfeldbeleuchtung oder auch mit Hilfe der Giemsa'schen und der Löffler'schen Beizenfärbung kleine rundliche Körperchen wahrzunehmen. Da aber nur die mit dem Ausgangsmaterial beimpften Nährböden sich als virulent erwiesen und die Virulenz schon bei der ersten Ueberimpfung erlosch, nehmen die genannten Autoren, wie es scheint, jetzt selbst nicht mehr an, Kulturen in Händen gehabt zu haben. Die Trübungen der Nährmedien und die mikroskopischen Befunde rühren nach der Meinung von Leiner, von Wiesner und Römer vielleicht von der verimpften Nervensubstanz her.

Die pathogene Wirkung des Poliomyelitiserregers ist vermutlich Schwankungen unterworfen. Auf die Möglichkeit qualitativer Aenderungen weist schon der wechselnde Charakter der Krankheit

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in verschiedenen Epidemien hin und nach den Erfahrungen von Flexner und Lewis führt die oft wiederholte Uebertragung auf Affen eine erhöhte und gleichmässige Virulenz für diese Tierart herbei, so dass man vielleicht von einer Art von Passagevirus sprechen könnte. Erfahrungen anderer Autoren und meine eigene sprechen aber dafür, dass eine Anpassung des Virus nicht leicht und vielleicht nicht regelmässig stattfindet. Die Infektionsversuche mit direkt vom Menschen stammendem Material gelangen nur in einem Teil der Fälle und auch bei Passageimpfungen kommen gelegentlich Miserfolge vor, wie ich es bei den ersten Versuchen einer Ueberimpfung von Tier zu Tier trotz Anwendung der intracerebralen Infektionsmethode zu bemerken hatte.

Recht zahlreiche Versuche wurden unternommen, um die Pathogenität des Virus für verschiedene Tierarten zu prüfen, und so ein leichter zugängliches Versuchsmaterial als Affen ausfindig zu machen. Leider haben diese Bemühungen keinen günstigen Erfolg gehabt. Die Möglichkeit Kaninchen zu infiziren wurde, nachdem diese Frage viel discutirt worden war, erst durch Marks wirklich bewiesen. Es ist aber auch nach der Arbeit von Marks noch nicht möglich, Kaninchen statt der Affen zu Versuchen zu verwenden, da man bis jetzt kein anderes Kriterium für die stattgefundene Infektion besitzt, als die Rückimpfung auf Affen. Ob die von Krause und Meinicke gemachten Kaninchenimpfungen wirklich zum Teil als gelungene Infektionen anzusehen sind, ist durchaus unbewiesen, da diese Autoren ebenso wie Lentz u. Huntemüller in keinem einzigen Falle mit ihrem Kaninchenvirus eine typische Affenpoliomyelitis hervorrufen konnten. Demnach sind die Ergebnisse dieser Experimente unverwertbar. Sicher ist es hingegen, dass in einer sehr grossen Zahl von Versuchen anderer Autoren die Infektion von Kaninchen mislang, obwohl die von Krause und Meinicke gegebenen Vorschriften genau befolgt wurden. (Römer, Leiner, und von Wiesner.)

Auf Grund der vorliegenden Beobachtungen ist das Virus der Poliomyelitis in eine Gruppe von Krankheitserregern einzureihen, die morphologisch unbekannt oder doch nicht sicher nachgewiesen, eine Anzahl gemeinsamer Eigenschaften haben und besonders durch ihre Affinität zum centralen Nervensystem ausgezeichnet sind, so dass man gewissermassen von neurotropen Virusarten sprechen kann. Hierher gehören die Erreger der Lyssa, der Aujeszky'schen Krankheit, der Römer'schen Meerschweinchenlähme der Borna'schen Krankheit und nach ihrem Verhalten bei Gänsen der Hühnerpest. Es ist gewiss daran zu denken, dass möglicherweise auch für die menschliche Neuropathologie noch andere in diese Gruppe gehörende Mikrobien von Bedeutung sind.

Näher liegt die Frage, ob in das ätiologische Bereich des Poliomyelitisvirus selbst andere Affekte als die typische spinale Kinderlähmung gehören. Das Vorkommen von Poliomyelitisinfektionen

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unter den Bildern der Meningitis und Neuritis, mit bulbären und pontinen Symptomen wurde schon durch Wickman festgestellt und neuerdings vielfach bestätigt. (Netter u. A.) Nicht so leicht ist es zu beurteilen, ob auch die als cerebrale Kinderlähmung bezeichnete Krankheit durch den gleichen Erreger verursacht wird. Für diese Ansicht ist das mehrmals beobachtete gleichzeitige Vorkommen der typischen spinalen und cerebralen Lähmungsform bei Geschwistern und die nicht selten angedeutete Beteiligung des Grosshirnes bei der menschlichen und experimentellen Poliomyelitis anzuführen, dagegen spricht die geringe Zahl der zur Zeit von Poliomyelitisepidemien beobachteten Fälle ausgesprochener cerebraler Lähmung und besonders die Unmöglichkeit das Bild der spastischen Hemiplegie selbst bei cerebraler Infektion von Affen hervorzurufen.

Dass chronische Erkrankungen an Poliomyelitis vorkommen, die als spinale Muskelatrophien verlaufen, wird durch die anscheinend gelungene Ueberimpfung in einem Falle von Muskelatrophie des Typus Hofmann-Werdnig, die ich und Levaditi vornahmen, wahrscheinlich gemacht. In gleichem Sinne ist vielleicht eine Beobachtung von Schick zu verwerten. Marburg vermutet auch den ätiologischen Zusammenhang der Myatonia congenita mit Poliomyelitis.

Mit der Einreihung in die Gruppe der spezifisch neurotropen Virusarten stimmt das Verhalten der Immunitätserscheinungen bei Poliomyelitis gut überein. Aehnlich wie gegen Lyssa lässt sich auch gegen Poliomyelitis active Immunität erzielen (Flexner und Lewis) und zwar etwa mit denselben Mitteln wie ort, d. i. (abgesehen von der Immunität nach überstandener Krankheit) durch Anwendung von getrocknetem, mit Desinfektionsmitteln z. B. Phenol (Kraus) behandeltem, durch Erhitzung geschädigtem Mark, mit Hilfe wiederholter subkutaner Injektionen vollvirulenten Materiales in allmählig ansteigender Dosis und wohl auch bei Anwendung von Mischungen des Virus mit Immunserum. Hier wie dort treten in Folge der Infektion oder Immunisierung nicht sehr intensiv wirkende Antikörper in das Serum über, sondern Stoffe, die zwar in vitro mit Virus gemischt dessen Infektiosität aufheben (Levaditi und Landsteiner), die aber keine guten Aussichten für die praktische Verwendung geben, da sie weder genügend schützen, noch heilend wirken. Eine direkte Beziehung der Immunitätserscheinungen bei Poliomyelitis und Lyssa besteht übrigens nicht, denn weder liess sich eine gegenseitige active Immunisierung erzielen, noch ein gekreuzter Effekt der Immunseren.

Dis bisher ausgeführten experimentellen Untersuchungen haben, wie aus dem gegebenen Ueberblicke zu entnehmen ist, eine Reihe von Aufklärungen gebracht, so dass, trotz des geringen Alters dieses Arbeitsgebietes die Kenntnisse über das Virus der Poliomyelitis nicht weit hinter denen zurückbleiben, die bei anderen filtrirbaren

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Mikrobien erreichbar waren. Nicht so leicht als die theoretische Aufklärung erscheint aber zunächst ihre Verwertung für die praktische Frage, die hier zur Verhandlung steht.

Wie schon angedeutet, sind vorläufig serotherapeutische Erfolge kaum zu erhoffen, wenn auch Flexner und Lewis im Tierexperiment bei subduraler Seruminjektion während der Inkubationszeit eine Schutzwirkung erzielten. Die theoretische Möglichkeit einer Vaccination besteht; sie wird aber nicht wie im Falle der Lyssa durch die Kenntnis der wahrscheinlich stattgefundenen Infektion und durch eine lange Incubationsfrist begünstigt. Ebensowenig ist es leicht einen Schutzstoff herzustellen, der die anscheinend schmale Zone zwischen Unwirksamkeit und Gefährlichkeit nicht überschreitet und das Postulat erfüllt, den Schutz durch einmalige Injektion zu bewirken. Dazu kommt noch die technische Schwierigkeit, dass vorläufig ein Vaccin nur durch Benützung von Affen herzustellen ist.

Begreiflicherweise wurden Versuche gemacht, die experimentelle Poliomyelitis chemotherapeutisch zu beeinflussen. So fruchtbar sich aber diese Forschungsrichtung für die Bekämpfung der Spirochaeten- und Trypanosomenkrankheiten erwiesen hat, so geringe Erfolge waren ihr bisher auf dem Gebiete der durch filtrirbare Erreger verursachten Krankheiten gegönnt. Die bei Poliomyelitis gemachten Versuche mit Arsacetin, Arsenophenylglycin, Salvarsan, Trypanrot, Aethylhydrocuprein blieben resultatlos. Einige Hoffnungen schöpfen Flexner und Clark aus der Anwendung von Urotropin und Derivaten dieser Substanz.

Da dem gesagten zufolge die Bestrebungen nach einer causalen Therapie sich noch im Stadium der Vorversuche befinden, kann die Bekämpfung der Seuche zunächst nur auf dem Wege der Prophylaxe versucht werden und wohl aus diesem Grunde haben sich nach Erledigung der wichtigsten das Virus und seine Wirkungsweise betreffenden Fragen die experimentellen Forschungen auf jene Punkte conzentrirt, die für die Aufklärung der Krankheitsübertragung von Bedeutung sind. Hieher gehört in erster Linie die Kenntnis der Infektionswege und der Ausscheidung des Virus.

Die nach dem Beispiel der Lyssaimpfung nächstliegende und gewöhnlich geübte intracerebrale Infektion, sowie die Erfolge der Einführung von Virus in die Nerven, die Bauchhöhle oder die Blutbahn sind für die Erforschung des Infektionsmodus beim Menschen begreiflicherweise verhältnismässig irrelevant. Wichtiger ist, dass experimentelle Infektionen auch unter Bedingungen erfolgten, die den natürlichen Verhältnissen einigermassen entsprechen und zwar besonders von Respirationstrakte aus (Leiner und v. Wiesner) z. B. durch Pinseln der cocainisirten Nasenschleimhaut oder Einlegen von Tampons in die Nase. Nicht so leicht gelangen Infektionen vom

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Verdauungskanale aus, aber auch dieser Weg führte unter besonderen Bedingungen (Injektion in eine Darmschlinge, Fütterung mit dem Magenschlauch und Opiumdarreichung) mehrmals zum Ziel. Eine Richtlinie gab bei diesen Arbeiten ähnlich wie bei den Untersuchungen über die Eigenschaften des Virus die Analogie mit einer anderen Infektionskrankheit, als Flexner und Lewis darauf hinwiesen, dass in Bezug auf die Epidemiologie eine Verwandtschaft zwischen Poliomyelitis und Cerebrospinal meningitis zu bestehen scheint, ein Gedanke, der sich in der Folge als fruchtbar erwies. Beide Erkrankungen befallen das centrale Nervensystem und zwar vorwiegend im jugendlichen Alter, die Art, wie die Fälle auf einzelne Familien und Häuser verteilt sind, stimmt insofern überein, als mehrfache Erkrankungen relativ selten auftreten; bei beiden Affektionen ist die Beteiligung von Virusträgern aus epidemiologischen Gründen wahrscheinlich. Von diesen Aehnlichkeiten ausgehend vermuteten Flexner und Lewis, dass wie bei Meningitis cerebrospinalis auch bei der Kinderlähmung das Virus möglicherweise von der Schleimhaut des Nasen-Rachenraumes durch die verbindenden Lymphwege in das Centralnervensystem gelange und auf dem umgekehrten Wege wiede (ausgeschieden werde)[1] und die Autoren fanden bald eine Tatsache, die diese Hypothese stützt, nämlich das Vorhandensein von Virus in der Nasenschleimhaut erkrankter Affen. Der Befund wurde ergänzt, als ich Levaditi und Pastia auch mit den Tonsillen und der Rachenschleimhaut eines menschlichen Falles positive Impfergebnisse erzielten.

An diesen Punkte angelangt ergab sich zunächst eine Lücke in den experimentellen Resultaten, da es in mehreren Versuchen nicht glückte, das Virus in den Ausscheidungen nachzuweisen und so zu zeigen, wie es in die Umgebung des Kranken gelangen kann. Auch dieses Postulat wurde aber erfüllt, da ich, Levaditi, Danulesco und Thomsen im Nasenschleim erkrankter Tiere, der durch Einlegen von Wattetampons gewonnen war, den Infektionsstoff auffanden und das gleiche Resultat auch bei der menschlichen Krankheit sichergestellt wurde. Kling, Wernstedt und Pettersson hatten Gelegenheit eine Reihe solcher Untersuchungen während einer Epidemie, die in Schweden im Jahre 1911 in grosser Intensität auftrat, auszuführen. Sie injizirten möglichst grosse Mengen filtriter Sekrete der Mund- und Nasenhöhle und Filtrate des Darminhaltes und hatten fast regelmässig positive Imperfolge. Der Aufklärung bedürftig ist es, dass andere Autoren, wie Strauss, Rosenau, Sheppard, und Amoss, bei dieser Versuchsanordnung keine Erfolge hatten.

Es ist klar, dass diese Erhebungen eine Stütze für die von Wickman auf Grund seiner epidemiologischen Arbeiten nachdrücklich vertretene Kontagionshypothese der Poliomyelitis geben. Die von Wickman angeführten Gründe—Auftreten der Fälle in Gruppen

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radiäre Verbreitung innerhalb der Krankheitsbezirke, Fortschreiten der Epidemien längs der Verkehrswege, Häufung von Fällen in Schulen—und seine Argumente für die Bedeutung der Virusträger und abortiven Fälle, wurden von einer ganzen Reihe von Autoren anerkannt und durch neue Beobachtungen bekräftigt.

Allerdings fehlt es nicht an Kritikern und Gegnern der Wickman'schen Anschauung (Zappert, Wennerberg u. A.) und es lässt sich nicht läugnen, dass auch die Kontagionshypothese viele Punkte unerklärt lässt und wie diese Autoren anführen mit manchen Erfahrungen sogar im Widerspruche zu stehen scheint. Nicht aufgeklärt ist das Culminiren der Epidemien im Sommer und Herbst, auffallend die starke Krankheitsfrequenz in sehr volkarmen Gegenden und die oft geringe Ausbreitung der Seuche in dicht bewohnten Städten, die Seltenheit der Krankenhausinfektionen und die grosse Zahl isolirt bleibender Fälle. Diese Umstände zeigen jedenfalls, dass die Gefahr der direkten Ansteckung keine sehr beträchtliche ist, ein Verhalten, das sich übrigens bei der cerebrospinalen Meningitis wiederfindet.

Im Experiment ist bis jetzt bei selbst inniger Berührung gesunder Tiere mit erkrankten eine Ansteckung nie beobachtet worden und wenn es auch leicht möglich ist Affen mit Poliomyelitis zu infiziren, so gibt es noch keine Methode, um in einem Affenkäfig eine Epidemie dieser Krankheit hervorzurufen.

Nach alledem muss man annehmen, dass bei der Verbreitung der Poliomyelitis, auch unter Voraussetzung ihrer Kontagiosität, Momente in Betracht kommen, die sich gegenwärtig der Kenntnis entziehen, obwohl Nachforschungen nach verschiedenen Richtungen hin gemacht wurden.

Für die Möglichkeit der Uebertragung durch Nahrungsmittel oder Gebrauchsgegenstände sprechen nur ganz vereinzelte Erfahrungen, z. B., eine Beobachtung Wickman's für die Infektion durch Milch. In dieser Beziehung ist das Ergebnis von Versuchen anzuführen, aus denen hervorgeht, dass Virus in Milch oder Wasser einige Wochen lang erhalten bleibt. Grössere Bedeutung hat möglicherweise Staub als Vehikel des Virus. Auf diesen Faktor hat Hill aufmerksam gemacht und auch die Angabe von Eichelberg und Müller dass Kinder von Schuhmachern, die Gelegenheit zur Berührung mit schmutzigem Schuhwerk haben, auffallend häufig erkranken, gehört hierher. Dass das Virus der Poliomyelitis gegen Eintrocknung resistent ist, wurde schon erwähnt; es ist noch auf den Unterschied hinzuweisen, der in diesem Punkte gegenüber dem Verhalten der Meningococcen besteht.

Sehr wichtig sind Versuche die Neustädter und Thro über die Bedeutung des Staubes angestellt haben. Diese Autoren sammelten Staub aus Wohnräumen von Poliomyelitiskranken und prüften

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Extrakte davon an Affen auf ihre Pathogenität. Tatsächlich erhielten sie positive Resultate, die durch den histologischen Rückenmarksbefund und die Ueberimpfung auf andere Affen verificirt wurden. Ein wie grosses Interesse der Fortsetzung dieser Versuche zukommt, braucht kaum erwähnt zu werden.

Für die Annahme, dass Insekten die Infektion vermitteln, besteht keine sichere tatsächliche Grundlage und das Vorkommen von Epidemien auch bei Winterkälte ist als Argument gegen diese Mutmassung angeführt worden. Dass Fliegen einige Zeit lang wirksames Virus baherbergen können, wenn sie absichtlich damit in Berührung gebracht werden, haben Versuche von Flexner und Clark gezeigt.

Auch die Frage, ob höhere Tiere als Zwischenträger fungiren können, ist erörtert worden, besonders dessalb, weil mehrfach Berichte über das Vorkommen nervöser, zu Lähmungen führender Erkrankungen verschiedener Tierarten (Hühner, Hunde, Pferde) zur Zeit von Poliomyelitisepidemien gemacht wurden. Diese Tierarten sind aber nach den bisher ausgeführten Versuchen für das Virus der Kinderlähmung nicht empfänglich und, soweit man eine Untersuchung vorgenommen hat, wurde nichts gefunden, was auf einen ätiologischen Zusammenhang mit Kinderlähmung hinweisen würde. Im Besonderen erwähnt Flexner, dass sich die Affektionen der Hühner und Hunde nicht auf Affen übertragen liessen.

Ueberblickt man das bisher gesammelte experimentelle Material, so findet man kaum greifbare Anhaltspunkte für eine andere Art der Infektion, als durch direkten und indirekten Kontakt oder durch Staub. Da ausserdem auch die epidemiologische Beobachtung Fälle kennen gelehrt hat, in denen Kontaktinfektionen durch Kranke oder gesunde Virusträger als sehr wahrscheinlich bezeichnet werden müssen, so kann trotz der noch bestehenden Unklarheiten vorläufig nur diese Annahme zur Basis prophylaktischer Bestrebungen gemacht werden.

Ueber die Anzeigepflicht besteht wohl keine Meinungsverschiedenheit, controvers ist hingegen die Frage der Isolierung. Die voraussichtliche Wirksamkeit dieser Massregel lässt sich vorläufig nicht leicht beurtheilen. Andrerseits kann man aber auch schwer die Verantwortung tragen, die Berührung mit Kranken ganz unbeschränkt zu lassen, die nachgewiesenermassen Virus ausscheiden und zwar eines, das vielleicht schon durch Uebertragung auf die intakte Schleimhaut zu infiziren vermag und vermutlich auch von gesunden Menschen verschleppt wird. Sicher begründete Vorschriften über die notwendige Dauer einer Isolierung, die am besten in Krankenhäusern erfolgen dürfte, werden erst zugeben sein, sobald der zeitliche Verlauf der Virusausscheidung in den Sekreten festgestellt ist. Erst dann wird zu entscheiden sein, ob der Befund von Osgood und Lucas, die noch fast 6 Monate nach der Infektion das

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pathogene Agens in den Schleimhäuten von Affen auffanden, zu verallgemeinern ist und auch für die Sekrete gilt. Empfohlen wurde eine Isolierungsdauer von 1 bis 2 Monaten.

Eine Beschränkung des Verkehrs von Personen aus der Umgebung der Kranken, insbesonders die Abhaltung der Geschwister kranker Kinder vom Schulbesuch ist jedenfalls anzuraten (Müller, Römer); für den Fall grosser Epidemien wurde auch die Sperrung der Schulen empfohlen. Die Ueberwachung der Virusträger, die nach Ansicht Wickman's für die Krankheitsübertragung von grosser Bedeutung sind, scheitert an der praktischen Ummöglichkeit der Diagnose. Schwierigkeiten ergeben sich übrigens auch für die Erkennung zweifelhafter und abortiver Fälle, da die zu Gebote stehenden diagnostischen Mittel noch zu wünschen übrig lassen.

Ein Fortschritt in diagnostischer Beziehung liegt in der besonders von amerikanischen Autoren (Peabody, Drapereu. Dochez, Lucas, Frissell) im Anschluss an Flexner's Untersuchungen gewonnenen Erkenntnis bestimmter Veränderungen des Liquor cerebrospinalis in den Frühstadien der Krankheit. Versuche eine Komplementbindungsreaction aufzufinden waren erfolglos, hingegen ergab sich die theoretische Möglichkeit der Serumdiagnose aus der von Levaditi und mir gemachten Beobachtung, dass das Serum erkrankter Affen in vitro die Wirksamkeit des Virus aufhebt. Das Verfahren liess sich auch bei menschlichen Seren anwenden und von Netter und Levaditi, Müller und Römer, Anderson und Frost wurde eine grössere Reihe von Fällen untersucht. Positive Resultate fanden sich bei sporadischen und epidemischen, bei abortiven und alten Erkrankungen. Trotz der günstigen Berichte dürfte Vorsicht in der Beurteilung am Platze sein, da die Specificität der Reaktion noch nicht quantitativ ausgewertet wurde und einige Resultate z. B. von Müller und Römer, Peabody, Draper u. Dochez, und von mir an die Möglichkeit unspecifischer positiver Ausschläge denken lassen. Eine grosse Schwierigkeit für die systematische Prüfung und praktische Benützung der Reaktion liegt natürlich in der Notwendigkeit Affen zu verwenden. Das gleiche Hindernis steht praktisch-diagnostischen Sekretuntersuchungen durch Tierexperimente entgegen, wenn sie in grösserem Masstabe ausgeführt werden sollen, ganz abgesehen von der langen Dauer solcher Versuche.

Eine verhältnismässig leicht zu erfüllende Forderung ist es, die Sekrete und Darmausscheidungen von Kranken zu desinfiziren und besondere Aufmerksamkeit muss nach den referirten Ergebnissen von Neustädter und Thro auf die Reinigung und Desinfektion der Wohnungen gerichtet werden. Wie Römer und Joseph gezeigt haben, ist für diesen Zweck die gewöhnliche Formalindesinfektion vollkommen brauchbar.

Mit Rücksicht auf die angenommene und jetzt schon nachgewiesene Infektiosität der Nasen-Rachensekrete wurde auch empfohlen diese

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Gegenden mit keimwidrigen Substanzen zu behandeln, als welche auf Grund von Versuchen Wasserstoffsuperoxyd, Kaliumpermanganat und Mentholpräparate in Betracht kommen. Jedenfalls verdienen zu Zeiten der Poliomyelitisgefahr acute Erkrankungen der Nase und des Rachens grosse Beachtung, da Symptome von Seite dieser Organe neben Störungen des Verdauungskanales (Diarrhoe) zu den häufig beobachteten Initialsymptomen gehören. In einer Anzahl von Fällen beginnt die Kinderlähmung mit Angina und selbst unter dem typischen Bilde einer Angina follicularis, der die Lähmungen nach kurzen Zeit oder auch erst nach 1 bis 2 Wochen folgen können. (vgl. Zappert.)

Man muss sich die Frage vorlegen, ob diese initialen Anginen, die in manchen Epidemien häufig vorkommen, wirklich spezifisch sind, ob also das Virus der Poliomyelitis tatsächlich eine Entzündung der Tonsillen hervorrufen kann und es ist wohl auch die Möglichkeit zu erwägen, dass es sich in diesen Fällen und vielleicht auch bei anderen prodromalen Lokalinfektionen um Wirkungen anderer Mikrobien z. B. Kokken handeln könne, die den Erregern der Poliomyelitis den Weg bahnen. Untersuchungen über diese epidemiologisch wichtige Frage, liegen noch nicht vor. Eine Art von Mischinfektion scheint übrigens durch O. Thomsen schon festgestellt zu sein. Während einfache Hautimpfungen mit Poliomyelitis bei Affen keinen Effekt hatten, trat nach cutaner Verimpfung einer Mischung des Virus mit Vaccine typische spinale Lähmung ein und mit dieser Methode liessen sich mehrere Tierpassagen erzielen. Die Resultate von Thomsen werden zusammen mit vorliegenden Berichten über Fälle von Kinderlähmung im Anschlusse an die Vaccination, die Vornahme der Schutzpockenimpfung zur Zeit von Poliomyelitisepidemien contraindicirt erscheinen lassen.

Es ist gewiss nicht zu verkennen, dass alle bisher gemachten Vorschläge zur Verhütung der Kinderlähmung provisorischen Charakter haben und dass über ihren tatsächlichen Effekt erst die Erfahrung wird entscheiden können. Man darf aber hoffen, dass durch die neu gewonnene Möglichkeit mit Hilfe des Tierversuches das Virus bei den Kranken und in ihrer lebenden und leblosen Umgebung aufzusuchen, zukünftige epidemiologische Studien eine sichere Grundlage haven und so zu praktisch verwertbaren Ergebnissen führen werden. Eben erschienene Mittheilungen von Kling, Petterson, und Wernstedt, über das Vorhandensein von Virus bei abortiven Fällen und bei Gesunden, unterstützen diese Muthmassung.

[1] Wahrscheinlich erfolgt auf diese Weise die Uebertragung der durch ein neurotropes Virus verursachten, nach dem pathologisch-histologischen Befund der Poliomyelitis ähnlichen Borna'schen Krankheit.

[2] Vgl. hingegen die wichtige neue Mittheilung von Rosenau auf diesem Kongress.

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THE MODE OF INFECTION IN EPIDEMIC POLIOMYELITIS.

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The problem of prevention of infection in epidemic poliomyelitis still confronts us. Progress in the study of poliomyelitis has been made, and knowledge gained, but the question of supreme importance is this, Does this knowledge offer a solution of the mode of infection? With all diseases prevention is far better than the most perfect means of cure; with poliomyelitis it is better first because at present there exists no specific or true curative treatment, and second and chiefly, because for the most part when the disease is first recognized it has already caused irreparable damage. An understanding of the mode of infection would lead inevitably to the framing of measures of prevention that with reasonable certainty could be expected to bring about a limitation of the extent of the epidemic spread.

The infectious agent or virus of poliomyelitis attacks chiefly the central nervous system. Indeed, it has been detected regularly in the spinal cord and brain, and in the mesenteric lymph nodes among all the internal organs. It has also been detected in the mucous membrane of the nose and throat, and in the mucus secretions of this membrane, and in the mucus secretions of the stomach, and the small and large intestines. The virus has not been detected in such important organs as the spleen, kidneys, liver, or bone marrow. The fact is significant, but in attempting to interpret it, account should be taken of the circumstance that at present we possess one means only of detecting the virus, and that is its transmission to monkeys, in which it produces characteristic paralyses and anatomical changes. On this account small quantities of the virus may conceivably escape discovery. However, the conclusion is none the less inevitable that detectable amounts of the poliomyelitic virus exist only in the few situations and organs mentioned. The distribution of the virus is identical in human beings, the subjects of so-called spontaneous poliomyelitis, and in monkeys, in which the experimental affection is produced. Nor does it matter how the experimental inoculation is accomplished and whether the virus is introduced by injection into the brain or large nerves or subcutaneous tissue or peritoneum, or whether it is merely applied to the nasal mucous membrane. In whatever way the infection is produced purposely, the distribution of the virus in infected monkeys is the same as in infected human beings.

The precise facts of the distribution of the virus are important for another reason than the establishment of the pathology of the disease. The virus is one that is not known to increase aside from the infected body, and hence in order that it shall be capable of propagating polio-

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myelitis, it must secure a means of escape from the infected animal. The escape is now known to occur along with the secretions of the nose and throat, and the discharges from the intestine. We are obliged, therefore, to ask ourselves what the means are by which the virus confined within the interior reaches these external surfaces of the body.

Let us begin by disregarding for the moment the essential point of the way in which the virus probably enters the body in infected human beings, and give our attention to the way in which it escapes in the infected monkey into the nose, throat, and intestines. We may first consider the instance in which the virus is deposited in the brain, in which it becomes sealed, as it were, and cut off apparently from the exterior of the body. Having been injected into the brain tissue, the infectious microorganism constituting the virus multiplies both within and about the brain tissue at the site of inoculation. As multiplication progresses, the virus leaves the original site of injection and wanders to adjacent and distant parts of the central nervous tissues, becoming implanted in the medulla, the spinal cord, and the intervertebral ganglia, as well as reaching the pia-arachnoidal membranes, or meninges, in which it also spreads. Ultimately, when the virus becomes sufficient in amount, it brings about anatomical changes in the nervous system, one of the results of which is paralysis. The period intervening between the inoculation and the appearance of paralytic symptoms may be as brief as two or three days, or as long as three, four, or five weeks. The great disparity in this period depends upon the amount and quality of the virus, as well as the degree of resistance of the inoculated monkey.

The virus, which has found its way to the meninges, does not long remain in the cerebrospinal fluid, with which it escapes in part into the blood, in which it does not appear to undergo any further increase in amount, and indeed seems even incapable of surviving long. A part also of the virus contained within the cerebral fluid escapes regularly by way of the lymphatic channels surrounding the short nerves of smell that pass from the olfactory lobes of the brain to the mucous membrane of the nose. It has long been known that there is an intimate connection between the lymphatic vessels of the nasal mucous membrane and the lymphatic spaces of the pia-arachnoidal membrane. The virus once having gained the mucous membrane of the nose may even escape into the mucus secretion, with which it is carried into the mouth, and in part swallowed, or it may become established in the substance of the nasal membrane, where it undergoes subsequent multiplication and increase. As a matter of fact, both occur. The virus escapes with the secretions partly externally to the infected body, and a part of it is swallowed with the secretions themselves,

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while a persistent infection of the secretions is maintained by means of the increase that takes place in the membrane itself. In this way is assured the escape of the virus directly into external nature, as well as the contamination of the gastrointestinal cavity, with the discharges of which it becomes commingled. From the intestine it reaches in some amount the mesenteric lymph nodes, and thus enables us to account for the occurrence of the virus in those lymphatic nodes which form a notable exception to the general internal organs of the body.

We have now followed the route by which the poliomyelitic virus, implanted within the apparently closed cavity of the skull, reaches the exterior of the body. It is obvious that in the spontaneous form of the infection in man no such mode of introduction of the virus can occur. The virus must indeed enter the human body by some external channel, after which it seeks and becomes implanted upon the central nervous system. It is known that in monkeys the virus is incapable of passing the barrier of the unbroken or slightly abraded skin, of being taken up from the stomach or intestine unless the functions of these organs are previously disturbed and arrested by opium, and it is further known that it traverses with difficulty or even not at all the substance of the lungs. On the other hand, it is established that the virus passes with readiness and constancy from the intact, or practically intact, mucous membrane of the nose to the central nervous system, and that this membrane, next to the direct intracerebral introduction of the virus, provides the readiest method of successful inoculation.

Hence the view that the nasal mucous membrane is the site both of ingress and egress of the poliomyelitic virus in man. Support for this view is found in the study of the pathology of epidemic poliomyelitis, as well as by the fact established incontestably by experiment that the virus of the disease is regularly present in the nasal mucous membrane and its secretions, both in infected human beings and monkeys.

Still one link in the chain of causation of epidemic poliomyelitis as here outlined remained to be forged. The clinical evidence is strong in suggesting that human carriers of the poliomyelitic virus exist. The virus has now been detected in the secretions of the nose, throat, and intestine of persons suffering from abortive or ambulant attacks of poliomyelitis. The unrecognized examples of the abortive disease play a highly important part in the dissemination of the virus, through which the area of infection is extended, and the number of the attacked increased. A similar part has been accorded by clinical observation to the healthy virus carrier, and the healthy

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carrier is the last to be detected and confirmed experimentally. The obstacles in the way of this confirmation are considerable but not insuperable. It is to be remembered that we possess no means of discovering the virus of poliomyelitis except that of animal inoculation. Pettersson and his associates now believe that they have demonstrated the virus in washings from the nose and throat of healthy persons in intimate contact with acute cases of the disease.[1]

The preponderance of cases in the late summer and autumn months early suggested an insect carrier of the infection. House flies can act as passive contaminators, since the virus survives upon the body and within the gullet of these insects. Howard and Clark attempted unsuccessfully to infect the common varieties of mosquito and the body and head louse, while they succeeded in one series in producing infection in bed bugs which were made to feed upon the blood of inoculated monkeys. The virus remained alive within these insects for a period of many days. The inoculation of monkeys with a filtrate prepared from them gave rise to characteristic paralysis and anatomical lesions. This result is significant, since it shows that insects are capable of taking up the virus from the blood where it exists in minimal quantities and in harboring it for a considerable period in an active state; but it does not show that multiplication occurs within them or that in nature they act as the agents of inoculation.

It is unsafe to draw hard and fast conclusions regarding the mode of infection in epidemic poliomyelitis from the number of cases occurring, or their focal distribution, or the seasonal period of the greatest prevalence of the epidemic. While it is true that many more instances of single than of multiple cases occur, yet multiple ones are only less frequent than single ones, and not by any means rare. The prevailing views on this topic are being modified rapidly by the recognition of the abortive and ambulant examples of the disease. While the period of greatest prevalence of the epidemic is during the months of August, September, and October in the northern hemisphere, and the corresponding months in the southern hemisphere, the epidemic begins in the early spring and summer months, and the disease does not wholly disappear during the winter months. It can not be affirmed strictly that the disease dies out necessarily at any period of the year. While there are epidemic factors relating to poliomyelitis that are not understood, they are neither remarkable nor unique. If the fact of seasonal prevalence is reversed, all the ordinary factors of case frequence and focal distribution relate equally to epidemic meningitis. Epidemic poliomyelitis, like epidemic meningitis, is preeminently a disease of early childhood and finds the highest percentage of its victims in the first five years of

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life, but does not wholly spare older children or even adults. Like epidemic meningitis, it appears in a frank and in an abortive or ambulatory form, appears to be transmitted by a virus that enters and escapes from the body in the region of the mucous membrane of the nose and throat, can be transported by active infected carriers, and probably by healthy passive carriers of the specific microorganism or virus, and fortunately is limited in its extension by a high natural indisposition or insusceptibility to infection existing among persons of all ages.

[1] The histological findings in their monkeys were atypical and inconclusive. We have had an undoubted instance of infection from the filtered nasal washings of the healthy parents of a recent case of epidemic poliomyelitis in a young child. The monkey developed paralysis, and the histological findings were typical.

UEBER DIE VERBREITUNGSWEISE DER EPIDEMISCHEN KINDERLÄHMUNG UND DIE VERHÜTUNG IHRER VERBREITUNG.

ALFRED PETTERSSON, Professor, Statsmedicinska Anstalten, Stockholm, Schweden.

Am Ende des vorigen Sommers, da die Kinderlähmung in Schweden eine drohende Ausbreitung genommen hatte, bekam die Mediz. Staatsanstalt in Stockholm vom Kgl. Gesundheitsamte den Auftrag, Versuche anzustellen, um zu erforschen, in welcher Weise die Krankheit übertragen wird. Als Mitarbeiter bei diesen Versuchen habe ich die Herren Dr. Carl Kling und Wilhelm Wernstedt gehabt.

Da besonders in der letzten Zeit die Tatsachen sich gehäuft hatten, die dafür sprechen, dass die Krankheit kontagiös ist, so musste in erster Linie an den kranken Menschen als Infektionsquelle gedacht werden. Es galt also zuerst, zu erforschen, in welcher Weise der Krankheitserreger den kranken Menschen verlassen kann. Viel gab Veranlassung, daran zu denken, dass er auf den Schleimhäuten der Kinderlähmungskranken vorkommen könnte. Unsere Versuche richteten sich deshalb darauf, dies zuerst zu untersuchen. Auf Grund früherer misslungener Versuche hielten wir eine sehr gründliche Spülung der Schleimhäute für nötig. Teils deshalb, teils um Schleimhäute der Untersuchung unterziehen zu können, die bei Lebenden nicht, wie die des Dünndarmes, oder nur mit Schwierigkeit, wie die der Trachea und Bronchien, untersucht werden können, haben wir unsere Versuche zuerst an Toten vorgenommen. Mit physiologischer Kochsalzlösung wurden die Schleimhäute des Mundes, des Rachens und der Nase, der Luftröhre, und des Dünndarmes sorgfältig abgespült und die Spülflüssigkeit nach dem Filtrieren durch Heim Affen injiciert. Dies wurde bei 16 Leichen vorgenommen.

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Das Ergebnis findet sich in der folgenden Tabelle:

TABELLE I.

	Mund.	Trachea.	Darm.	Rückenmark.
Oskar G. E. A—n.	0	+	+	—
Gunnar S—t.	+	0	+	+
Gustaf Adolf H. V—n.	+?	+/+	+?	−
Carl Runo C—n.	+	+	+	+
Sir Linnea E—n.	−	−	+	−
Einar L—l.	+	+	−	+
Jenny Florida F—n.	−	+	+	+
Sigurd G—n.	+/+	−	−	+
Gustaf Erik G—n.	+	0	+	+
Artur Valdemar C—n.	+	+	+	+
Rolf B—m.	+	+	−	−
Per Lars J. L—n.	0	−	0	+
Nils V. L—n.	−	−	+	−
Lilly G—n.	0	+	+?	+
	11	10	11	9

Das günstige Resultat dieser Versuche führte uns zu der Untersuchung lebender Patienten. Bei diesen wurden ebenfalls Mund, Rachen und Nase, aber statt des Dünndarmes der Dickdarm, näher bestimmitdie Flexura sigmoidea, untersucht. Das Resultat geht aus der Tabelle II hervor:

TABELLE II.

	Mund.	Darm.
Gunhild G—n.	+	−
Ingrid S—g.	+/+−+\+	+
Sigrid Maria R—g.	0	+
Johan K—n.	0	0
Erik Wilhelm N—g.	0	+
Elsa N—g.	+	+
Johan Emil E—n.	+	+−+? +−0\+
Arvid Ernfrid S—g.	+	+/+
Harry R+m.	+	−
Astrid L—n.	0	+
Erik S—m.	+<0\0	+−+?
Gösta E—t.	+ 0	+ +−+
	7 + 5 0	9 + 1 0
	12	10

Nach dem Feststellen des Vorkommens des Krankheitserregers auf den Schleimhäuten bei typischen Fällen von Kinderlähmung gingen wir zu der Untersuchung von Abortivfällen, sowie der ganz gesunden Individuen in der Umgebung von typischen Poliomyelitiskranken

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über. Das Resultat dieser Versuche war der gelungene Nachweis des Kinderlähmungsvirus bei mehreren der untersuchten Personen.

In drei Familien mit festgestellten Kinderlähmungsfällen konnte bei anderen Familienmitgliedern, die nur leichte und uncharakteristische Symptomezeigten, das Vorkommen des Kinderlähmungserregers auf ihren Schleimhäuten durch Affenversuche nachgewiesen werden. In drei anderen Familien, die keinen typischen Kinderlähmungsfall gehabt hatten, gelang in derselben Weise der Nachweis von Abortivfällen. Schliesslich fanden wir in sechs Familien mit Kinderlähmungsfällen Keimträger, d. h. gesunde Personen, die das Virus auf ihren Schleimhautsekreten trugen. Eine Familie beherbergte davon zwei, und zwei Familien je drei.

Schliesslich versuchten wir zu bestimmen, wie lange nach der Krankheit der Erreger der epidemischen Kinderlähmung sich auf den Schleimhäuten der Konvaleszenten hält, indem wir diese wiederholten Ausspülungen der genannten Schleimhäute unterzogen und die Filtrate Affen injizierten. Das Resultat geht aus der Tabelle III hervor:

TABELLE III.

	1. Woche.		2. Woche.		3. Woche.		4. Woche.		5. Woche.		7. Woche.		-. Monat.		4. Monat.		6. Monat.		7. Monat.	
	Mund.	Darm.	Mund.	Darm.	Mund.	Darm.	Mund.	Darm.	Mund.	Darm.	Mund.	Darm.	Mund.	Darm.	Mund.	Darm.	Mund.	Darm.	Mund.	Darm.
Ingrid S—g....	+	+	–	–	–	–	+	+	+	+?	–	–	–	–	–	–	–	–	0	0
Sigrid Maria R—g....	–	–	0	+	–	–	0	–	–	–	+	0	–	–	–	–	–	–	+	0
Erik Wilh. N—g.....	–	–	0	+	?	0	–	–	–	–	–	–	+	+	–	–	+	+	–	–
Elsa N—g.....	+	+	+	+	–	–	–	–	–	–	–	–			–	+	–	–	–	–
Harry R—m...	+	–	+	?	–	–	–	–	–	–	–	+	–	–	+	?	–	–	–	–
Astrid L—n....	0	+	+	+	–	–	–	–	?	+	–	–	–	–	?	0	–	–	–	–
Erik S—m.....	+	+	+	0	–	–	–	–	+	0	–	–	–	–	–	–	–	–	0	–
Gösta E—t.....	0	+	?	+	–	–	–	–	?	?	–	–	–	–	–	–	–	–	0	0
Ingeborg H—d.	0	+	–	–	–	–	–	–	–	–	–	–	–	–	+	+	–	–	–	–

Es ist uns somit gelungen, das Vorkommen des Erregers der epidemischen Kinderlähmung auf den Schleimhäuten des Mundes, der Nase und des Rachens, der Trachea und des Darmes nachzuweisen an Leichen von an Kinderlähmung Verstorbenen. Wir haben auch seine Anwesenheit auf denselben Schleimhäuten mit Ausnahme der Luftröhre, die nicht untersucht wurde, bei typischen Kinderlähmungsfällen während des Lebens, feststellen können. Wir haben ihn weiter bei sehr leicht erkrankten Patienten ohne für Kinderlähmung charakteristische Symptome gefunden, bei Patienten, die einesteils in der nächsten Umgebung von Kinderlähmungskranken lebten, andernteils mit solchen, so viel bekannt geworden ist, in keinerlei Berührung waren. Schliesslich haben wir die Anwesenheit des

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Kinderlähmungsmikroorganismus bei vollständig gesunden Personen in der Umgebung von Kinderlähmungspatienten nachgewiesen. Wie von Wickman, Zappert, Müller, Netter und anderen hervorgehoben worden ist, kommt in Kinderlähmungszeiten eine bedeutende Zahl von Fällen vor, die keine der bisher als charakteristisch angesehenen Symptome haben. Unter diesen kann die klinische Diagnostik nur in einer kleinen Zahl die wahre Natur der Krankheit bestimmen.

Diesen leichten Kranken muss nun weiter eine bedeutende Zahl als Seuchenverbreiter dienende Keimträger angereiht werden.

Da der Krankheitserreger auch auf den Schleimhäuten völlig gesunder Individuen gefunden wird, muss angenommen werden, dass er von aussen her dahin gekommen ist. Unter solchen Umständen liegt kein Grund vor, diese Uebertragungsweise auch bei Kranken, typischen oder atypischen, zu verneinen. Das Vorkommen des Virus auf den Schleimhäuten bei Kranken muss also nicht notwendigerweise als das Resultat eines Ausscheidens desselben aus dem Inneren des kranken Körpers angesehen werden. Im Gegenteil es kann auf eine Vermehrung der von aussen her der Schleimhaut zugeführten Keime beruhen. Dass auch eine Ausscheidung stattfinden dürfte, ist durch die Beobachtungen an Affen, von Landsteiner, Levaditi und Danulesco, sehr wahrscheinlich gemacht. Wie oft und in welcher Menge eine solche Excretion des Virus beim Menschen vorkommt, ist aber bis jetzt völlig unbekannt.

Nach unserer Erfahrung können Abortivfälle und Keimträger vier bis fünfmal so zahlreich sein als die Fälle mit typischen Symptomen. Die Abortivfälle sind wohl auch von Abortivfällen und Keimträgern umgeben. Unter solchen Verhältnissen kann es kein Wunder nehmen, dass wir bis jetzt öfters keine Verbindung zwischen den einzelnen typischen Fällen gefunden haben. Um die Wege der Infektion verfolgen zu können, ist es nötig, Spuren davon zu finden, was bisher eben nicht möglich gewesen ist. Das Bild Jägers von der epidemischen Cerebrospinalmeningitis lässt sich sehr gut auch in Bezug auf die epidemische Kinderlähmung verwenden. Die Ausbreitung der Seuche zeigt sich wie eine in Nebel gehüllte Gebirgslandschaft, wovon nur die Spitzen zu sehen sind, wenn der Nebel aber schwindet, wird man auch die Ketten sehen können die die Spitzen verbinden.

Wenn einmal Methoden entdeckt sein werden, die eine ätiologische Diagnose, statt der jetzigen symptomatologischen, gestatten, dann wird der Nebel, der jetzt die epidemische Kinderlähmung in Bezug auf ihre Verbreitungsweise einhüllt, schwinden, uns den Gang der Infektion sehen lassend. Dann werden wir wahrscheinlich wahrnehmen, dass die Kinderlähmung eine recht gewöhnliche Kinderkrankheit ist, die im allgemeinen unter ziemlich leichten, uncharakteristischen Symptomen auftritt, mitunter aber einen bösartigen Charakter annimmt, Störungen seitens des Nervensystems hervorrufend. Auch andere

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Krankheiten verhalten sich bekanntlich in ähnlicher Weise. Scharlach z. B. zeigt bei gewissen Epidemien Neigung, Veränderungen der Nieren oder anderer Organe hervorzurufen. Wir werden dann eine Erklärung des Umstandes, dass Erwachsene seltener von der Krankheit angegriffen werden, vielleicht darin finden, dass diese die Krankheit in ihrer Jugend meistens durchgemacht haben. Schliesslich werden wir vielleicht sehen, dass die Ursache, dass grössere Städte verhältnismässig weniger von der Seuche heimgesucht zu werden scheinen, darin liegt, dass die nicht maligne Form, die bisher nie mit in Rechnung gezogen wurde, infolge des lebhafteren Verkehrs in den Städten weit verbreiteter ist als auf dem Lande. Auch in dieser Hinsicht würde die Kinderlähmung anderen Infektionskrankheiten, z. B. Masern, ähneln.

Wahrscheinlich kann die Verbreitung der Kinderlähmung auch auf andere Weise als durch direkte Uebertragung von Person zu Person stattfinden. Vielleicht wird die Seuche durch infizierte Gegenstände bzw. Kleider weiter geführt. Wickman erwähnt einen Fall, bei dem die Uebertragung vielleicht durch eine Zeichnung stattgefunden hat. Es muss auch in Betracht gezogen werden, ob möglicherweise Insekten, z. B. Fliegen, im Stande sind, das Virus zu übertragen. Direkte Beobachtungen, die für diese Uebertragungsweise sprechen, fehlen aber noch. Josefson hat in meinem Institute Verusche angestellt, dessen Resultate für die Möglichkeit der ersten Annahme, d. h. für die Uebertragung durch infizierte Gegenstände sprechen. Landsteiner, Levaditi und Pastia fanden, dass die Virulenz des Mikroorganismus nach 31-tägigem Verweilen in steriler Milch erhalten war, und Neustädter und Thro haben das Vorkommen des Erregers im Kehricht nachgewiesen.

Wickman hat Fälle mitgeteilt, die sehr den Verdacht erregen, dass sie durch infizierte Milch hervorgerufen sind.

Die Fälle der Kinderlähmung haben eine bestimmte Neigung, sich im Spätsommer und im Herbste zu häufen oder epidemisch aufzutreten. In dieser Beziehung besteht eine auffallende Aehnlichkeit mit Cholera, Dysenterie und Typhus. Die Ursache, wahrscheinlich dieselbe für alle vier Krankheiten, ist völlig unbekannt. Diese Jahreszeit begünstigt das Auftreten von Darmkrankheiten überhaupt und ganz speziell das der drei letzerwähnten. Es ist deshalb völlig verständlich, dass man früher den Darm als Eintrittspforte des Virus betrachtete, zumal pathologische Veränderungen des Darmes und der zugehörigen Lymphdrüsen meistens gefunden wurden.

Wenn man die hervorgehobenen Tatsachen in Betracht nimmt, so muss zugegeben werden, dass kaum schwerwiegende Gründe bestehen, die gegen die Richtigkeit der schon von Wickman angenommenen Verbreitungsweise durch Uebertragung von Person zu Person sprechen. Diese Verbreitungsweise muss sogar als sehr wahrschein-

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lich betrachtet werden, und das Auftreten der Seuche in scheinbar völlig isolierten Herden kann jetzt dadurch befriedigend erklärt werden.

Doch muss aber die Möglichkeit in Betracht gezogen werden, dass blutsaugende Insekten die Krankheit verbreiten können. Um die Wahrscheinlichkeit einer Uebertragung in dieser Weise richtig zu schätzen, müssen wir uns einiger Verhältnisse erinnern. Erstens haben die Versuche an Affen übereinstimmend ergeben, dass der Krankheitserreger nur in sehr kleinen Mengen im Blut vorkommt. Weiter dürfte er nur während der akuten Periode im Blute auftreten. Tierexperimente haben uns gelehrt, dass die Krankheit Immunität hervorruft, dass die Immunität eine mikrobizide Immunität ist, und dass die schützenden Substanzen im Blute vorhanden sind. Es muss folglich angenommen werden, dass der Mikroorganismus bei der Rekonvaleszenz aus dem Blute verschwindet. Eine Theorie, welche die Verbreitung der Krankheit durch blutsaugende Tiere zu erklären sucht, muss also immer mit frischen, akuten Fällen rechnen.

Auf Grund dieser Umstände dürfte es schon ausgeschlossen sein, dass durch Uebertragen mittelst blutsaugender Insekten das Auftreten und der Verlauf der epidemischen Kinderlähmung erklärt werden kann. Es liegen aber noch andere schwerwiegende Gründe gegen die Annahme einer Verbreitung durch Insekten vor. Flöhe, Läuse und Wanzen bleiben schon deshalb ausser Betracht, weil diese sich über weitere Strecken nicht verbreiten können. Es bleiben also nur andere Insekten übrig. Die epidemische Kinderlähmung hat bisher vorzugsweise den nördlichen Teil der temperierten Zone verheert. In dieser Region wird das Insektenleben durch die Wechsel der Jahrestemperatur hochgradig beeinflusst. Da die Lebenstätigkeit der Insekten durch die Kälte aufgehoben wird, so musste man, wenn eben diese Tierre die Uebertragung besorgen sollten, auch ein rasches Erlöschen der Epidemien beim Eintritt der Winterkälte erwarten. In Schweden ist niemals eine solche Uebereinstimmung zwischen der Jahrestemperatur und dem Verlauf der Seuche wahrgenommen worden, dass die Verbreitung durch Insekten sollte angenommen werden können.

Zufolge der grossen Zahl der Abortivfälle und Keimträger werden wir während einer Epidemie nicht im Stande sein, die Infektionsquellen durch Isolieren zu beseitigen. Wenn dies übrigens auch möglich wäre, so könnten wir die Rekonvaleszenten nicht so lange einsperren, bis sie von ihren Keimen frei werden. Trotzdem glaube ich jedoch aus Gründen, die ich im Zusammenhang mit den histologischen Veränderungen im Rückenmark nennen will, dass es zweckmässig ist, die akuten Fälle 2–3 Wochen zu isolieren. In Bezug auf sonstige Massregeln kann ich mich darauf beschränken, dem von Herrn Prof. Landsteiner Gesagten beizustimmen.

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DIE HISTOLOGISCHEN VERÄNDERUNGEN IM RÜCKENMARKE DES AFFEN BEI EXPERIMENTELLER POLIOMYELITIS.

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Die charakteristischsten Veränderungen des Rückenmarks von Menschen bei Poliomyelitis sind bekanntlich die Infiltration mit mononuklearen Leukozyten sowohl um die Gefässe herum als diffus und in Herden in der grauen Substanz, Entartung der Nervenzellen mit Einwanderung von mononuklearen und polymorphkernigen Leukozyten (Leukozytenneuronaphagie). Ein ähnliches Bild haben auch unsere Versuchsaffen oft dargeboten. Es leuchtet ein, dass die Infiltration mit Leukozyten die am meisten auffallende Veränderung ist, während die Entartung der Nervenzellen bisweilen recht unbedeutend ist oder vielleicht fehlen kann. Die Veränderungen dieser Art können deshalb zweckmässig als infiltrative bezeichnet werden.

Das Rückenmark von an Poliomyelitis eingegangenen Affen zeigt aber keineswegs immer dieses Bild. Oefters fehlt die zelluläre Infiltration vollständig oder fast vollständig, und meistens wird höchstens eine Anhäufung der weissen Blutkörperchen in den Gefässen wahrgenommen. Die charakteristischste Veränderung ist statt dessen die Entartung der Ganglienzellen des Rückenmarks. Der leichteste Grad dieser Entartung wird daran erkannt, dass die Nervenzellen sozusagen zu klein für die Räume sind in denen sie liegen, die Tigroidzeichnung ist nicht so scharf und die Zelle stärker gefärbt als gewöhnlich. Bei vorgeschrittener Entartung sind die Zellen mehr oder weniger stark geschrumpft, homogen, intensiv gefärbt und gewöhnlich mehr oder weniger intensiv vakuolisiert oder fenestriert. Die Vakuolen können klein und zahlreich sein, oder auch gross und wenige. Durch die Vakuolisierung und Schrumpfung sind die Ganglienzellen oft zu unregelmässigen sternförmigen Körpern oder schwammähnlichen Massen reduziert worden. In die in dieser Weise veränderten Ganglienzellen haben sich die umgebenden Gliazellen mehr oder weniger tief eingedrängt. In anderen Fällen macht sich die Entartung in der Weise bemerkbar, dass die Ganglienzellen sehr schwach gefärbt, äusserst feinkörnig oder fest homogen, am Rande wie zerfliessend sind.

Auch die Gliazellen zeigen öfters sehr deutliche Veränderungen. Sie sind geschwollen, klar und durchsichtig, und ziehen bei schwacher Vergrösserung die Aufmerksamkeit sofort auf sich, weil sie wie helle Flecken der Präparate aussehen. Zellenausläufer haben wir nicht wahrnehmen können, wenigstens nicht in Eisenhämatoxylinpräparaten. Nach Alkoholhärtung sieht das Protoplasma sehr homogen aus, meistens mit Andeutung einer sehr feinen, netzähnlichen Zeich-

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nung. In Gefrierschnitten aus in Formaldehyd gehärtetem Materiale hat aber der Zellenleib eine deutlich feinkörnige Struktur. Der Kern ist recht chromatinreich und zeigt ein zierliches Chromatingerüst. Bisweilen sind beinahe alle Zellen des Stützgewebes in dieser Weise verändert. Dies spricht entschieden dafür, dass die vergrösserten Zellen auch Gliazellen sein müssen, da eine Vermehrung der Zellen des Stützgewebes nicht stattgefunden hat. Ob die Mesenchymzellen der grauen Substanz ebenfalls in derartiger Weise verändert werden, haben wir nicht entscheiden können. Freilich haben wir öfters in derartiger Weise veränderte Zellen in verhältnismässig grosser Zahl längs der Gefässe gefunden, andererseits aber sie niemals in der Pia mater beobachtet. Wir haben diese Veränderung der Neurogliazellen Hypertrophie genannt, obwohl dieser Name nur die auffallendste Veränderung zum Ausdruck bringt.

Wie früher erwähnt wurde, fressen sich die hypertrophischen Zellen öfters in die Ganglienzellen hinein. Diese Beeinträchtigung der Nervenzellen unterscheidet sich in manchen Beziehungen von den bisher bei der akuten Poliomyelitis des Menschen und der experimentellen Poliomyelitis des Affen beschriebenen Neuronophagien. Bei den letzteren waren die Ganglienzellen, wie schon Rissler, der erste, der Neuronophagien bei der akuten Poliomyelitis des Menschen beobachtete, hervorgehoben hat, von sehr vielen Neuronophagen eingenommen. Diese Zellen, denen spezielle Aufmerksamkeit besonders Forssner und Sjövall sowie Wickman gewidmet haben, sind polymorphkernige Leukozyten und Polyblasten (Wickman). Die Polyblasten sind, nach Wickman, die eigentlichen Neuronophagen. Beide Zellensorten ähneln sich darin, dass ihr Protoplasma sich nicht, oder sehr wenig, von dem der Nervenzelle unterscheidet, wenigstens so lange diese letztere nicht sehr stark zerfallen ist. Bei den einzelnen Zellen sind öfters nur die Kerne gut zu unterscheiden. Die zweite Art von Neuronophagien, die von uns beobachtet worden ist, speziell bei den mit von Abortivfällen und Keimträgern stammenden Spülflüssigkeiten geimpften Affen, haben ein ganz anderes Aussehen. Die Zellen, die in die Nerven eingedrungen sind, besitzen einen grossen, rundlichen, durchsichtigen Zellkörper, der vom dunklen Protoplasma der Nervenzellen scharf differenziert ist. Dieser Unterschied besteth so lange fort, als von der Ganglienzelle etwas zu sehn ist. Bisweilen ähneln die letzten Reste der Nervenzellen einer dem grossen Neuronophagen aufsitzenden Mütze. Andere weit vorgeschrittene Fälle erinnern sehr an Osteoklasten, die sich in den Knochen hineinfressen. Bisweilen ist eine Abgrenzung verschiedener Zellen nicht zu finden, so dass es aussieht, als ob man eine Riesenzelle vor sich hätte. Kernteilungsfiguren haben wir aber in solchen Zellen nicht beobachtet. Die von diesen Zellen hervorgerufene Zerstörung der Nervenzellen

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geht offenbar in anderer Weise von statten als die durch die Polyblasten verursachte. Es ist in der Tat sehr zweifelhaft, ob die Neuronophagen dieser Art, wenn man diesen Namen für sie überhaupt verwenden darf, von den zerfallenden Nervenzellen geformte Körperchen aufnehmen. Wir haben wenigstens in Marchipräparaten niemals Fettkörnchen in nennenswerter Zahl gefunden. Diese Neuronophagen sind offenbar nichts anderes als die vergrösserten Gliazellen der Umgebung der Ganglienzellen. Wir haben diesen Prozess Gliazellenneuronophagie genannt und den eben geschilderten Veränderungen den Namen degenerative beigelegt.

In einigen Fällen wurden beide Typen der Veränderungen gleichzeitig angetroffen, indem das Rückenmark sowohl Zelleninfiltration um die Gefässe herum als Degeneration der Nervenzellen mit Gliazellenneuronophagien, aber ohne Leukozytenneuronophagien zeigte.

Von grossem Interesse war es, zu wissen, wie oft nach der Infektion der Affen mit den Schleimhautsekreten infiltrative Veränderungen entstanden, und wie oft die Sekretedegenerative Veränderungen hervorriefen. Von 39 nach Impfung mit Spülflüssigkeiten von typischen Fällen eingegangenen Affen zeigten 9 (=93 Prozent) infiltrative und 30 (=77 Prozent) degenerative Veränderungen. In der zweiten Gruppe, d. h. Abortivfälle und Keimträger, waren die Zahlen 1 (=3 Prozent) infiltrative und 33 (=97 Prozent) degenerative und in der dritten Gruppe, Rekonvaleszenten 2 (=8 Prozent) bezw. 21 (=91 Prozent). Von den mit Rückenmark von Poliomyelitispatienten infizierten Affen gingen 8 zu grunde und zwar 2 mit infiltrativen und 6 mit degenerativen Veränderungen.

Nun werder Sie vielleicht sagen: Diese Veränderungen sind nicht von dem Poliomyelitisvirus hervorgerufent, und das Vorkommen derselben beweist nicht, dass eine experimentelle Poliomyelitis vorliegt, weil die Leukozyteninfiltrationen und die Leukozytenneuronophagien fehlen. Ich glaube doch.

(1) Haben wir sie bei Affen mit klinisch typischen Paresen gefunden, während andere Veränderungen bei den Versuchstieren fehlten.

(2) Haben wir durch Injektionen von Rückenmarken, die nur solche Veränderungen zeigten, bei anderen Affen typische experimentelle Piliomyelitis mit zellulärer Infiltration und Leukozytenneuronophagien hervorrufen können.

(3) Haben wir nach Injektion einer Emulsion von typischen Poliomyelitisrückenmark bei einem Tiere infiltrative, bei einem anderen degenerative Veränderungen finden können. Es dürfte somit keinen Zweifel unterliegen dass auch diese Veränderungen vom Poliomyelitiserreger hervorgerufen und für ihn in gewissem Grade charakteristisch sind.

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Auf Grund verschiedener Tatsachen halten wir weiter dafür, dass das Auftreten infiltrativer Veränderungen beim Versuchsaffen auf grössere Virulenz des Kinderlähmungserregers hindeutet, während degenerative auf eine verhältnismässig geringere Virulenz schliessen lassen.

Während der Rekonvaleszenz büsst das Sekret der Schleimhäute seine Fähigkeit, infiltrative Veränderungen hervorzurufen, ein. Dies geht recht schnell, scheint im allgemeinen in etwa 8–14 Tagen stattgefunden zu haben.

Man darf wohl deshalb auch auf eine gleichzeitige Verminderung der Virulenz des Erregers schliessen.

Während einer Epidemie werden wir nicht im Stande sein, alle Kinderlähmungsfälle zu isolieren, und bei eventueller Isolierung könner wir unmöglich die Konvaleszenten so lange einsperren, bis sie vom Virus frei sind, was eine Zeit von mehreren Monaten in Anspruch nehmen würde. Ich glaube aber, dass es berechtigt und vielleicht zweckmässig ist, so weit wie möglich, die akuten Fälle 2–3 Wochen zu isolieren. Dadurch werden wir bewirken, dass auf die Individuen, die von den Konvaleszenten nachher eventuell infiziert werden, ein schwächeres Virus übertragen wird, wodurch eine leichtere Form der Krankheit vielleicht hervorgerufen werden wird.

EINIGE EPIDEMIOLOGISCHE BEOBACHTUNGEN BEI DER KINDERLÄHMUNGSEPIDEMIE IN SCHWEDEN, 1911–1912. KURZES RESUMÉ.

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Die Kinderlähmungesepidemie, die im vorigen Jahre in Schweden begann und noch fortfährt, ist die grösste, die jemals in unserem Lande vorgekommen ist, und wenn man die Zahl der Fälle mit der Volksmenge vergleicht, vielleicht die schwerste Epidemie, die jemals aufgetreten ist. Wie aus den Studien von Wernstedt hervorgeht, nahmen nach der Epidemie vom Jahre 1905 die Kinderlähmungsfälle rasch ab, so dass sie in den Jahren 1909 und 1910 nur 178 bzw. 180 betrugen. Schon im April 1911 aber konnte man an vier Stellen eine Anhäufung von Fällen wahrnehmen, und während der Sommermonate nahm die Epidemie mit so grosser Schnelligkeit zu, dass im September, dem Monate, wo sie ihren Höhenpunkt erreichte, mehr Fälle gemeldet wurden als während des ganzen Jahres 1905. Die Zahl der im Jahre 1911 gemeldeten Fälle betrug 3,840. Weder das Auftreten der Kinderlähmungsfälle im Jahre 1910 noch im Anfang des Jahres 1911 berechtigt zu der Annahme dass die Epidemie aus einer einzigen Infektionsquelle entstanden ist. Die vier erwähnten ersten Herde waren etwa 200 bis 300

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Kilometer von einander entfernt, und drei von ihnen lagen sogar von grösseren Landstrassen weit entfernt. Die zwei nördlichsten betrafen Gebirgsdörfer weit abseits von dichter bevölkerten Plätzen. Im Gegenteil, das zerstreute Auftreten von sporadischen Fällen und kleinen Gruppen von Fällen über das ganze Land während der Jahre 1906–1911 spricht vielmehr dafür, dass das Virus schon vorher weit verbreitet war, wahrscheinlich Ueberreste der grossen Epidemie von 1905 ausmachend.

Öfters ist hervorgehoben worden, dass die Kinderlähmung mit Vorliebe entfernt von dichter bevölkerten Plätzen liegende Ortschaften heimsuchte. Die Ausnahmen von dieser Regel sind aber auch zahlreich. Im Jahre 1905 kam es, wie Wickman besonders hervorhebt, in keiner der schwedischen Städte zu einem epidemischen Ausbruch der Krankheit, nur sporadische Fälle wurden beobachtet. Die grösste Zahl, zehn Fälle, hatte Stockholm. Ganz anders verhält sich die im Jahre 1911 begonnene Epidemie. Sehr auffallend ist ein recht bedeutendes epidemisches Auftreten in den zwei grössten Städten des Landes, Stockholm und Gothenburg. Stockholm hatte 1911 mehr als 200 Fälle, und Gothenburg, bis zum August 1912, mehr als 100. Auch in anderen Städten häuften sich die Fälle zu nicht unbedeutenden Epidemien. Nach Wickman's Berechnungen kamen 1905 etwa 7 Prozent aller Fälle auf die Städte. In 1911 betrug die Zahl der Fälle in den Städten 19.3 Prozent. Werden auch Marktflecken und Municipalgemeinden, die mehr den Städten als dem Lande ähneln, unter den ersteren mitgenommen, so steigt die Perzentzahl auf 25, d. h. ¼ aller Fälle. Nun macht aber die Bevölkerung der betreffenden Plätze eben ¼ der Einwohner des ganzen Landes aus. Die Seuche hat also, im Gegensatz zu der Epidemie von 1905, die Städte und ähnliche Ortschaften in gleich hohem Grade wie das Land verheert. Dehnt man aber den Vergleich zwischen Land und Stadt nicht auf das ganze Königsreich aus, sondern beschränkt ihn auf die angegriffenen Bezirke oder Landschaften, so findet man in der Tat immerfort die grösste prozentische Menge der Fälle in den Landgemeinden. Auch die am schwersten befallenen Städte Eksjö und Huskvarna waren prozentisch bei weitem nicht so schwer heimgesucht wie mehrere der Landgemeinden. Die eigentliche Verschiedenheit der letzten Epidemie den vorigen gegenüber liegt also darin, dass sie eine grössere Menge von Städten befallen hat. Diese sind aber verhältnismässig leicht davon gekommen, während die Epidemie auf dem Lande ebenso wie früher schwerer gewesen ist.

Die epidemische Kinderlähmung zeigt eine bestimmte Neigung, grössere oder kleinere Herde zu bilden. Zwischen den Herden kommen nur zerstreute Fälle vor, und zwar gewöhnlich in der Umgebung der Herde. In derselben Weise hat sich auch die jetzige Epi-

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demie verhalten. Einer der Herde zieht in besonderem Grade die Aufmerksamkeit auf sich. Er erstreckte sich über die Regierungsbezirke Jönkäpings und Kalmar län. Seine Länge betrug ungefähr 160 Kilometer. Die Zahl der Kinderlähmungsfälle dieses Herdes war 1,300, also bedeutend mehr als die ganze Epidemie von 1905.

Das grösste Interesse bietet aber die Verbreitungsweise der Seuche innerhalb dieses Herdes dar. Der Ausgangspunkt der Epidemie ist die kleine Garnisonstadt Eksjö. Schon in der Mitte des Juni trat hier in der Familie eines Eisenbahnarbeiters ein Fall auf. Die bald darauf folgenden Fälle konnten in Zusammenhang mit diesem gesetzt werden. Von der Stadt her breitete sich nun die Epidemie mit mässiger Schnelligkeit in allen Richtungen ziemlich regelmässig aus. Wenn man die am meisten peripher gelegenen Fällen zu verschiedenen Zeiten mit Linien verbindet, erhält man ziemlich konzentrisch gelegene Kreise. Mit der Zeit hörte die Epidemie in den zentralen Teilen des Herdes auf.

Von mehreren Autoren ist hervorgehoben worden, dass die Krankheit eine gewisse Neigung hat, nach einiger Zeit in den alten Herden aufzuflammen. Eine solche Tendenz hat aber die Epidemie von 1911 in Schweden nicht gezeigt. Eine nähere Untersuchung gab das Resultat, dass in keinem von den fünf Herden der Epidemie vom Jahre 1905, die Kinderlähmung 1911 epidemisch aufgetreten ist. Nur sporadische Fälle sind dort beobachtet worden. In der Umgebung oder in der Nähe aber der meisten Herde des Jahres 1905 hat die Seuche 1911 neue Herde gebildet. Der eine von den Herden 1905 ist sogar von der Epidemie 1911 beinahe eingeschlossen worden, ohne dass eine nennenswerte Anzahl von Fällen auf dem alten Platze auftraten. Nur in einer Gegend, welche von der Epidemie 1905 heimgesucht wurde, waren die Fälle 1911 etwas zahlreicher. Dieser Ort war aber 1905 verhältnismässig leicht betroffen worden, sodass zwischen den Anhäufungen von Fällen ziemlich grosse Strecken frei waren. Nun ist es bemerkenswert, dass die Fälle von 1911 eben in diesen vorher geschonten Ortschaften auftraten. Es ist schwer bestimmt zu sagen, worauf dies beruht. In Anbetracht der gelungenen Immunisierungen von Affen liegt es aber sehr nahe, an eine Immunisierung der Bevölkerung der betroffenen Ortschaften zu denken. Freilich kann man gegen eine solche Annahme einwenden, dass eine allzu geringe Prozentzahl der Bevölkerung angegriffen worden war, and vor allen Dingen, dass eine neue empfängliche Generation nach der vorigen Epidemie entstanden war. Dazu ist erstens zu bemerken, dass wahrscheinlich eben die empfänglichsten Individuen von der ersten Epidemie betroffen wurden, und dass ihre Zahl sicher vielfach grösser ist als die Zahl der krank gemeldeten. Wenn es sich um eine Einschleppung der Krankheit

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handelt, müssen wir uns auch erinnern, dass dies für gewöhnlich wohl nicht durch die Kinder geschieht, die ja im allgemeinen keinen grossen Verkehr haben, sondern eher durch die älteren Leute. Wie dem auch sein mag, so scheint man gewisse Hoffnungen hegen zu können, dass ein Ort, an dem die Seuche schwer aufgetreten ist, davon einige Jahre hindurch verschont bleiben wird.

THE ETIOLOGY OF POLIOMYELITIS AND PROPHYLACTIC MEASURES.

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While work of great importance has been done in the field of poliomyelitis and light has been shed on many obscure points, the disease still remains a mooted problem and baffles us at every attempt to unravel the mysteries of its most salient features.

In order to combat the scourge successfully, to prevent its occurrence, to check its spread, and to cure it after the onset, we must gain a more complete knowledge of the character of the virus, the mode of infection, and the manner of its dissemination.

Of the character of the virus we know that it is filterable through a porcelain filter; that it withstands glycerinization, cold, and drying for a certain time; that it is destroyed by heat at 45°–50° C. within half an hour or by a 2 per cent solution of peroxide of hydrogen, by corrosive sublimate, and by menthol. The morphology of the virus, the method of the cultivation of it *in vitro*, and the character of its host, these most important problems at issue are still enveloped in the deepest mystery.

The mode of infection, however, it seems to me, can be accepted as fairly established. That the disease is infectious no one will gainsay. An infection can be propagated either by the circulatory or lymphatic system. No evidence has as yet been adduced that the circulatory system is the primary route, while evidence in favor of the lymphatic system seems to me to be conclusive.

Since poliomyelitis is preeminently an infantile disease, occurring in the dry season, since no particular neighborhood or character of the living premises plays any material part in the spread of the disease, since several children in the same family may be attacked successively, and since, in a given house, children are attacked in different families in fairly quick succession and along lines of neighborly communication, I have concluded that the virus probably lurks in the dust and that the nasopharynx must be the point of entry. That the lymph current is probably the avenue of transmission strengthens my theory.

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In the early part of 1910 I began my experiments to prove this theory. The experiments were fully published,[1,2] but I shall take the liberty of giving a cursory review.

Sweepings of rooms where cases of poliomyelitis were present, or had been recently, together with the dust accumulated on wooden trimmings of rooms, were collected and prepared for injection in the following manner: The samples of sweepings were macerated in sterile water for a number of hours, the menstrua were filtered through paper and then through a Berkefeld and French bougie porcelain filter, respectively. These filtrates were then injected intracerebrally, intraspinally, and subcutaneously into monkeys. Two of the monkeys had abortive attacks, as subsequently proved by clinical symptoms and pathologic findings. One monkey injected with the extract of the dust of a very severe case had all the clinical features and pathologic lesions of poliomyelitis. An emulsion of the brain and cord of the infected monkey was injected into two other monkeys and both animals showed the clinical symptoms and pathologic lesions of the disease after an incubation period of 7 and 14 days, respectively. As a control, four other monkeys were injected with sterile water; a second one with normal salt solution; a third one with an extract of dust from two different rooms in two different houses where no case of poliomyelitis occurred, prepared in the same manner as was the dust of all other rooms where cases of poliomyelitis occurred. The sterile water as well as the salt solution was passed through a Berkefeld filter before injection. The fourth monkey was injected with an extract of the brain and spinal cord of a normal monkey. All the four monkeys remained well and are well to-day after the lapse of five months. Another monkey was injected with a 5-months-old emulsion of a poliomyelitic monkey which was kept in a refrigerator. This animal was quite ill after seven days, but fairly recuperated. A month thereafter it was killed, and we found the characteristic lesions of poliomyelitis in the surrounding pia of the cord, but the vessels and the cord substance were intact. This monkey evidently had an abortive attack. It is pertinent here to remark that not all the monkeys contracted the disease. I have thus proved the theory that poliomyelitis virus lurks in the dust of the sick room, and we may also conclude from the above experiments as well as from the heretofore-enumerated deductions that the nasopharynx is the point of entry.

THE MANNER OF DISSEMINATION.

The manner in which the virus finds its way into the dust is no longer pure conjecture. The nasopharyngeal discharges are certainly the medium of the transfer of the virus into the atmosphere in the same manner as the bacillus of tuberculosis. Once in the atmosphere

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the virus may be disseminated in the following manner: (1) By direct contact; (2) by healthy carriers, as human beings, on clothing, or by domestic animals; (3) by winds scattering the dust; (4) by bathing in stagnant water in an infected neighborhood.

METHOD OF PREVENTION.

Measures of a prophylactic nature to prevent the spread of the affection should be instituted with a fair hope of success. These must be carried out with a view of eradicating the causes above enumerated.

1. The streets of a neighborhood where cases occur should be thoroughly washed and oiled daily.

2. The floors and trimmings of an apartment where a case occurs should be scrubbed daily with an antiseptic solution.

3. Everyone occupying the premises should have his nasopharynx sprayed with hydrogen peroxid to be followed by a spray of salt solution. This procedure applies equally to the patient.

4. A strict quarantine should be maintained for at least two months.

5. Bathing in stagnant water in a neighborhood where a case has occurred should be prohibited, as well as playing around sand heaps.

6. Household pet animals should be thoroughly disinfected, thoroughly bathed and scrubbed with an antiseptic solution, and removed from premises.

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[1] Neustaedter and Thro: New York Med. Jour., Oct. 21, 1911.

[2] Experimentelle Poliomyelitis acuta, von M. Neustaedter, M. D., Ph. D., and William C. Thro, A. M., M. D., Deutsche Medizinische Wochenschrift, April 11, 1912.

THE OCCURRENCE OF INFANTILE PARALYSIS IN MASSACHUSETTS, 1907–1912.[1]

Reported for the Massachusetts State Board of Health by MARK W. RICHARDSON M. D., secretary.

It is not the purpose of this communication to present a detailed discussion of the disease known as anterior poliomyelitis or infantile paralysis. Its scope will be restricted rather to a consideration of those facts and observations which have been noted in the Massachusetts experience for the years 1907 to 1912, inclusive, and which have seemed rather unusual and therefore possibly worthy of special emphasis.

In the first place, if one looks at the map of Massachusetts and observes the incidence of this disease, he will notice that there seems to be a distinct preference for localities situated along the river beds. In 1907, for instance, the incidence of the disease was especially noticeable in the Berkshire district along the banks of the Hoosac

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and Housatonic Rivers. Furthermore, the valley of the Merrimac seemed also to be especially affected. In 1908 the valley of the Deerfield River was the seat of an especially marked epidemic. It may be, of course, that this apparent predilection for river beds is of no special significance and may mean only that river beds are more likely to be more densely populated and more likely to have ordinary roads, trolley roads, and railroads running through them, and are therefore associated with greater possibilities of contact for larger bodies of people. In this connection, however, it must be borne in mind that bodies of water may become the breeding places for a great variety of insects, and the incidence of this disease in the neighborhood of bodies of water may be shown by further investigation to be due to a greater prevalence in those districts of such insects.

Another fact brought out by the map of 1907 would seem to be that the distribution of infantile paralysis corresponded in a general way to the density of the population, and in this connection an interesting comparison was made with the incidence of cerebrospinal meningitis. The two diseases coincided in localization for 1907. In 1908, however, the grouping was largely different, cerebrospinal meningitis still being more prevalent where the population was dense, whereas infantile paralysis saw its greatest epidemic in a rural community. Furthermore, it was shown that the maximum incidence of infantile paralysis in 1907 took place in September, whereas in cerebrospinal meningitis the maximum incidence occurred in March. As far as this comparison went, therefore, there seemed to be no parallel between these two diseases, so far as epidemiological factors were concerned.

The year 1908 was remarkable for a small but well-marked epidemic in the northwestern part of the State, affecting especially the towns on and adjacent to the Deerfield River. In fact, the history of this epidemic shows that, per thousand of the population, the town of Colrain in this epidemic suffered far and away the most serious damage ever noted in the State of Massachusetts. In 1910 there occurred what seemed at the time to be a very marked epidemic in the city of Springfield, in which epidemic at least 150 cases were reported—that is to say, an incidence of 1.6 per thousand of population—and yet, in 1908, the town of Colrain, above mentioned, with a population of 1,800, had 24 cases of infantile paralysis—that is to say, 13 cases per thousand of population. It would seem that in a community so severely attacked as this incidence would indicate that there would be abundant evidence as to the high degree of its contagiousness, and yet careful inquiry during the investigation of 67 cases, in which there was little or no attempt at isolation, shows that there were 166 children in families affected, only 4 of which later acquired the disease. In addition, there were 86 children among

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the neighbors and friends, making a total of 252 children. Indeed, the total number of children that were more or less intimately exposed to the 66 cases was probably twice or three times the number of known exposures.

Another point of interest in this connection, it seems to me, is the following: The Colrain district in 1908 was situated only 30 or 35 miles from the city of Springfield. It was in comparatively intimate relation with said city, through the agency of high roads, trolley roads, and railroads. There was, therefore, constant interchange of population between these two districts, and yet in 1908 there were in the city of Springfield but two cases of infantile paralysis, and the intervening towns along the Connecticut River showed, at most, three cases in Holyoke, one in Chicopee, and one in Hatfield. In view of this experience it seems to me that whatever one may think of its contagiousness, as affecting persons in immediate contact with patients, transfer of the infection by indirect contact through third persons must be very rare, if it ever occurs.

Another interesting point which has been noted by others is that a region once severely infected is not apt to be stricken during the succeeding year, and the Massachusetts maps of 1907 and 1908 show this phenomenon quite plainly. You will see that, for instance, in 1907 the Berkshire district had a considerable number of cases, whereas in 1908 there were very few. Furthermore, you will note that the Colrain district, which was severely affected in 1908, has been practically free from the disease ever since. In 1909 it is apparent that the Berkshire district again became severely affected, and again in 1910 the number of cases dropped off very markedly, even though the valley of the Connecticut River at this time showed a very large number of cases.

The experience in Massachusetts has been that the disease is less readily transmissible than scarlet fever, typhoid fever, or diphtheria, but of course in such a comparison the abortive cases of infantile paralysis were not included. Even if such cases were included, however, I have little doubt that infantile paralysis, as compared with the diseases mentioned, is very much less contagious.

Another point which seems to stand out very sharply in the Massachusetts investigations is that the disease is very distinctly one of suburban or rural communities, rather than one affecting more especially the cities. This statement rests upon the observations of 2,138 cases which have been analyzed in this regard for the years 1907 to 1910. The average population for the first 25 cities and towns most affected proved to be 5,205, whereas the average population of the 25 cities and towns least affected was 52,674; that is to say, cities and towns where the disease was relatively least frequent were 10 times as large, on the average, as those where it was most frequent. As a

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control to this table, cases of scarlet fever reported in the State, for the year 1910, showed that, in the 25 cities and towns in which scarlet fever was most prevalent, the average population was 6,446, whereas, in the 25 where it was least prevalent, the average population was 7,638. In other words, there would seem to be some conditions radically different in the spread of infantile paralysis as compared with scarlet fever. This fact, taken in connection with the experience detailed above in the relation to cerebrospinal meningitis, which disease, together with scarlet fever, is well known to be spread by contact with the nasopharyngeal secretions, must be given very weighty consideration when we come to estimate the rôle of these same secretions in the spread of infantile paralysis, for the conditions favoring the transfer of these secretions; that is to say, the density of population, school attendance, overcrowding in wintertime, and unhygienic surroundings—in other words, conditions found most prominently in city life—are not those which apparently favor the spread of infantile paralysis. Infantile paralysis, therefore, being in Massachusetts, at least, a country disease, one would look for some determining cause in country conditions to cause this apparent predilection for the rural districts, and we find, as a result of investigation, that country children are very much more openly exposed to any possible influence which animal disease might have upon them than are city children. For instance, in the 25 cities and towns where the disease was least prevalent—that is to say, in the larger cities and towns—there was one cow to every 84 inhabitants and one horse to every 32 inhabitants, and in the 25 cities and towns where the disease was most prevalent there was one cow to 11 inhabitants and one horse to 14 inhabitants. This table became very much more striking when a comparison was made of the numbers of swine, fowls, and dogs. Now it is known that all these animals are subject at times to paralysis of varying types, and, in a considerable number of instances, paralysis in animals has been associated with paralysis in human beings. A considerable number, however, of paralyzed animals have been examined and emulsions of their spinal cords have been injected into monkeys, but as yet with no positive results. In this connection, furthermore, it is apparent that country children are much more subject to the bites of insects than city children, and the possibility that insects may act as intermediate hosts for the virus of infantile paralysis, and may convey this virus from infected animals or infected human beings to other animals or human beings, must always be strongly borne in mind. In 1911 an investigation along this line of 88 cases, in 17 cities and towns, showed that in all instances the ordinary stable fly, *Stomoxys calcitrans*, was present in or about the house of the infected individual. Experiments looking to the possible infection of monkeys through the bites of this fly will be reported upon later by Prof. Rosenau.

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Meteorological records show that since 1904 Massachusetts has been subject to a constant deficiency in rainfall. Such a deficiency would naturally be associated with a considerable increase in the amount of dust. When it is considered, however, that the disease has greatly affected other portions of the country in which there has been no such deficiency in rainfall, the importance of this failure in the rain supply can not be considered to be great.

An investigation as to the occurrence of this disease in institutions for children showed that such children were much less liable to the disease than those leading an ordinary manner of life. As a result of their somewhat complete isolation, they would seem to enjoy comparative freedom from infection.

Osgood and Lucas found an active virus in the nasopharyngeal membrane of the monkey five and a half months after an acute attack, and in the tonsils of a human being six months after an attack. These observations have naturally a very important bearing upon the question of contagion. In the first place it suggests very strongly that the disease is transmitted by the secretions of the nasopharyngeal membranes, and, furthermore, that danger of contagion may persist for many months and possibly longer. This in spite of the fact that Rosenau, Sheppard, and Amoss failed to demonstrate the virus in the mouth and nose of 18 patients in various stages of the disease. It is, however, well known that positive results have been secured recently by Kling, Wernstedt, and Pettersson. In other words, we have to do here, apparently, as in other infectious diseases, with the question of chronic carriers of disease and their relation to its propagation. Its importance becomes especially marked when we consider the number of cases which previous to infection have been in contact with chronic cases of infantile paralysis.

This persistence of the virus in the body of the infected individual may be important from another point of view, for there are a number of cases on record in the Massachusetts experience in which the patient has apparently suffered from a second attack of the disease a few weeks, months, or even years after the first attack. If such a second infection or reinfection may occur it must be considered as possible that the patient between attacks may be a chronic carrier of the disease and therefore possibly responsible for secondary cases in others. Certain it is that very closely circumscribed localities may suffer from the disease over a considerable period of years. For instance, in one of the larger cities of Massachusetts, within a very small circumscribed area, two cases occurred in 1903, two cases in 1908, one case in 1909, and one case in 1910. The suggestion that a chronic carrier of infection is responsible for this situation is very strong.

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As is seen from the map for 1910, the city of Springfield, which up to that time had suffered a considerable and unexplained immunity from this disease, suffered from a quite severe epidemic. Furthermore, investigation as to the mortality from this and other acute diseases in said city showed very interesting results in that the mortality from cholera infantum, whooping cough, and scarlet fever was also very much increased during this year. In fact the mortality rate for cholera infantum, which for 1907, 1908, and 1909 had averaged 27, in 1910 jumped up to 106. The suggestion is, of course, that a number of these cases of death reported as cholera infantum may have been and probably were typical cases of infantile paralysis of the gastrointestinal type.

So far as therapeutics are concerned little new knowledge has been gained through the Massachusetts investigations. Osgood and Lucas, to be sure, made some experiments upon monkeys, with a certain number of specific sera and vaccines, to see whether the specific immunity brought about by these sera and vaccines might not give a partial immunity to infantile paralysis. The results, however, were negative. Hexamethylenamin has been strongly recommended to the profession of Massachusetts as a possible prophylactic against the disease and quite generally employed.

A unique experiment with this drug was carried out at a certain boys' school in our State, an experiment which may be worthy of repetition by others under similar circumstances. At the opening of this school, in the fall, a boy who had been in Europe arrived, and was in intimate contact with at least 25 of his fellow pupils for a period extending over ten days or two weeks. He then developed infantile paralysis, much to the discomfort of the school authorities. The boy was isolated immediately and all the other pupils given hexamethylenamin in their drinking water. Whatever may have been the effect of this medication, no other cases developed in this school. On the other hand, we have had one or two other similar experiences where cases in prodromal stages have been in intimate contact with school children, and where no secondary cases have occurred, even though hexamethylenamin was not administered; facts which make us very conservative in estimating the effect of simple contact in the spread of the disease.

As regards prognosis, the Massachusetts experience has shown this to be much better than was previously supposed. In fact the following conclusions seem justified: In anterior poliomyelitis, complete recovery or function recovery occurs in over 25 per cent of cases examined at the end of four years. Atrophy may exist without impairment of function. In about one-half of the recovered cases, the onset was mild. The distribution of the paralysis in such recovered cases was not essentially different from that in cases which

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do not recover. Recovery in many instances required months and, in several cases, from one to three years.

Another interesting possibility is that herpes zoster may be a form of anterior poliomyelitis due to an unusual localization of the virus. Coincidence of this disease with epidemics of infantile paralysis has been noted, especially in recent years, by English observers. In the Massachusetts experience, certain striking cases have occurred. For instance, in 1912, there has occurred coincidently, in the same individual, anterior poliomyelitis and herpes zoster. Furthermore, we have a history also of anterior poliomyelitis in the child at the same time with herpes zoster in the father. Pathologists maintain that the changes occurring in the posterior ganglia of the spinal cord, in herpes zoster, resemble almost exactly those found in poliomyelitis in the anterior horns of the cord, and the hypothesis that the two diseases are due to the same virus with different localizations is certainly one worthy of further investigation.

Finally, Massachusetts experience has not been such as to support the theory that the disease is spread from person to person by direct or indirect contact. The rural preponderance of the disease, the comparative immunity of children confined in institutions and hospitals, the summer incidence, the failure of the disease to find its greatest incidence in cities and localities where density of population and overcrowding are most marked and the irregular distribution, have all militated against the acceptance of such a theory. In fact, the feeling among Massachusetts observers has been strong for some time that the epidemiology of this disease was best explained through the intermediate action of some biting insect, and evidence in support of this theory will be presented by Prof. Milton J. Rosenau, of Harvard University.

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[1] Investigation in Massachusetts of the disease known as anterior poliomyelitis or infantile paralysis was begun in 1907, at the instigation of Dr. Robert W. Lovett, who had been appointed recently a member of the State board of health. The work has been continued ever since along lines which have constantly broadened and the board has called to its service in these investigations the assistance of a considerable number of investigators and advisers. In carrying out details of the work the board has been fortunate in having the advice of such men as Dr. Henry P. Walcott, chairman of the board; Dr. Robert W. Lovett, member of the board; Prof. Theobald Smith, Prof. Milton J. Rosenau, Prof. John L. Morse, and Dr. J. Homer Wright. In the field work Dr. Philip A. E. Sheppard has been largely concerned. The State inspectors of health in their respective districts have investigated many cases and special epidemics have been the subject of more detailed investigation by Dr. Herbert C. Emerson, of Springfield; Dr. Lyman A. Jones, of North Adams; and Dr. Thomas P. Hennelly, of Pittsfield. Special lines of investigation have been pursued also by Prof. Theobald Smith, Prof. Milton J. Rosenau, Dr. Robert B. Osgood, Dr. William P. Lucas, Dr. Arthur W. May, Dr. Benjamin Wood, Dr. J. W. Hammond, jr., and Mr. Charles T. Brues, instructor in economic entomology in Harvard University.

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SOME EXPERIMENTAL OBSERVATIONS UPON MONKEYS CONCERNING THE TRANSMISSION OF POLIOMYELITIS THROUGH THE AGENCY OF STOMOXYS CALCITRANS.

M. J. Rosenau, Professor of Preventive Medicine and Hygiene, Harvard Medical School, Boston, Mass.; and Charles T. Brues, Instructor in Economic Entomology, Bussey Institution of Harvard University.

(A preliminary note.)

The work we are about to report was done for and under the auspices of the State Board of Health of Massachusetts. We should like to have it distinctly understood, and therefore emphasize the fact right in the beginning, that this announcement is to be considered as a preliminary report, for the work is still in progress. Certain results have been obtained which it seems advisable to announce at this juncture. In taking this action in announcing work before it is completed we have not assumed the sole responsibility, but have taken counsel with older and wiser heads, friends in whose judgment we have the highest regard.

When we first took up the study of this disease—infantile paralysis—with the State Board of Health of Massachusetts we considered all possible modes of transference of the virus from the sick to the well, but gradually focused our attention upon the fact that the disease seemed to be spread rather directly from person to person. In other words, the disease appeared at first blush to us to be a contagious disease, but one in which mild or abortive cases, missed cases, and third persons probably played an important rôle in the transfer of the infection. We were probably prejudiced in favor of this viewpoint on account of the splendid work of Wickman, whose publications we studied with care. We were further influenced to regard poliomyelitis as a "contagious" disease owing to the views of Flexner, who compared it to epidemic cerebrospinal meningitis, and who regarded that it spread in the light of a contact infection through the secretions from the mouth and nose. The analogy to meningitis was a very close one, and the experimental fact that the virus could be demonstrated in the nasal mucosa of monkeys (Osgood, Lucas, and others) seems to corroborate the suspicion that we are dealing with an infection spread very much as cerebrospinal meningitis is spread.

If these assumptions were correct, then the virus should be demonstrable in the secretions from the nose and throat. Rosenau, Sheppard, and Amoss therefore injected 18 monkeys with the nasal and buccal secretions obtained from 18 persons who were suffering with the disease at the time or in the stage of convalescence or from persons suspected of acting as carriers. These results were negative.

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At the same time Straus, of New York, had a series of negative results, and other American workers were also unable to find the virus where we assumed it should be. These negative results seemed to us to have positive significance and was the first definite indication that we were upon the wrong trail.

That poliomyelitis is not a "contagious" disease was clearly brought out by Dr. Richardson and other observers who have spoken this morning, all of whom have emphasized the point that the disease shows little or no tendency to spread in crowded districts, in schools, in institutions, in asylums, in camps, and in other places where one would expect a disease spread by contact through secretions of the mouth and nose to spread most readily. We have in mind the fact that many cases of the disease have been brought into asylums and hospitals throughout the State of Massachusetts in all stages of the infection, yet secondary cases have not occurred under such circumstances. On the contrary, the disease prevailed in Massachusetts more particularly in rural and country districts, sparsely settled.

Another reason that led us away from the theory of contacts and made us believe that we were not dealing with a contagious disease in the ordinary sense of that term was the close analogy between rabies and poliomyelitis. All investigators in laboratories who have worked with these two viruses have been struck with the similarity between rabies and poliomyelitis. Both viruses are diffused widely throughout the body, both exist in special concentration in the central nervous system, both are filterable, etc. Rabies being a wound infection made us conjecture that poliomyelitis may also be similarly transmitted.

Our experience with yellow fever, perhaps more than anything else, influenced us concerning the probable made of transmission of poliomyelitis. It had been the privilege of one of us to work with yellow fever both before and after the mosquito days, and many analogies came to mind which made us believe that poliomyelitis also was not a contagious disease.

All the various reasons that influenced us in turning from contagion to some other mode of transference need not engage our attention now, for the history of this part of the work has been ably and accurately given by Dr. Richardson in the paper which he has just read. In justice to Dr. Richardson we desire to state that all the essential conclusions of his paper were arrived at before he knew of the results in the laboratory with the monkeys.

The work which we now briefly desire to report consists in exposing monkeys during all stages of the disease to the bites of *Stomoxys calcitrans*. The monkeys were infected in the usual way by bringing an emulsion of a known virus obtained from human

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sources in direct association with the central nervous system. After the flies had had abundant opportunity to bite these infected monkeys during the various stages of the disease, including the period of incubation, healthy monkeys were then exposed to the bites of these same flies. Of 12 healthy monkeys indications of the disease have been obtained in 6, 3 of them in a virulent form, resulting in death, the other 3 with transient tremblings, partial paralysis, diarrhea, and recovery. It is interesting to note that several of the monkeys had diarrhea; therein the disease resembles the human disease more closely than when monkeys are simply inoculated with the virus into the brain, for gastro-intestinal upsets in children are frequently associated with infantile paralysis.

In these experiments it is important, we think, to use the proper technic in order to obtain successful results. The flies should be handled as little as possible. It is much better to handle the monkeys and leave the flies alone. In our experiment the flies were caught in nature, some of them were bred, placed in a large cage about 6 feet long by 5 or 6 feet wide, and some 3 or 4 feet high. The monkeys are stretched out at full length and wrapped in chicken wire. In this way they can be placed in the cage and the flies have full opportunity to bite. The flies appear to need a feed of blood about every day or two. They sometimes visit water, which is kept in the cage, but apparently can not be induced to eat any other food than the blood. At least in our experiments bananas, fruits, and other substances exposed apparently were little visited by the flies. Furthermore, in our experiments a very large number of flies were used.

In conclusion we desire simply to summarize the fact that we have apparently transferred the virus of poliomyelitis from monkey to monkey through the bite of the stable fly, *Stomoxys calcitrans*. We would like to emphasize the fact that this does not appear to be simply a mechanical transference, but rather a biological one, requiring a period of extrinsic incubation in the intermediate host.

What conclusions can we draw from these facts? At present it seems to us we would not be justified in drawing any conclusion—the significance of the facts, if confirmed,[1] is self-evident.

[1] These results have since been confirmed by Anderson and Frost (U. S. Pub. Health Reports, Oct. 25, 1912, XXVII, No. 43, p. 1733).

DISCUSSION.

Prof. GEORGE H. NUTTALL, Cambridge, England: Dr. Rosenau's remarks are extremely striking, and I look forward with the greatest interest to the confirmation of these experiments. But we know how many pitfalls there are in connection with work of this kind, as

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pointed out in the work of the sleeping sickness commission, but Dr. Rosenau is very cautious in coming to conclusions. It looks very much as if he has proved his point. It will be interesting now to follow up the biology of this fly. I have been carrying on investigations for many years in connection with this fly as bearing on the transmission of other infections. It would be interesting to find out how this period of incubation is affected by temperature and how long it lasts.

With regard to the food of the fly I have kept it alive for weeks, feeding it on blood, but have also fed it on grape juice. It will be interesting to note in connection with these experiments how the virus of poliomyelitis remains in an esophageal diverticulum and not in the alimentary canal. The experiments by Dr. Graham Smith in Cambridge tended to show that in some cases the flies feed on certain bacteria, which they retain for a long time in their bodies, storing them in the esophageal diverticula. These flies in England are known as rain flies, because they came into houses after rain. I should like to know if there is any connection with the rains and this fly. During the rainy season with us in England these flies rush into houses, and I have observed this for the last 15 years. It is quite a characteristic habit of these creatures, and it may have a definite bearing in relation to the incidence of the disease.

Prof. Dr. Loeffler, Germany: There seems to be a difference of opinion on the part of those who have addressed the congress in regard to the causal agent of poliomyelitis. Prof. Pettersson says that the disease is transmitted by an agent which does not at all involve the fly, for the reason that cases of this disease come under his observation in the winter months when there are no flies. On the other hand, Dr. Rosenau has stated that he believes the disease is transmitted by flies, or at any rate he shows the possibility of the disease being transmitted by these insects. These differences of opinion need to be reconciled. They require solution.

Dr. Francis E. Fronczak, Buffalo: I am the unfortunate health officer in whose community at the present time, outside of Los Angeles, Cal., there are more cases of acute anterior poliomyelitis than in any other place on the continent. Since January 1, 1912, there have been reported up to date 269 cases, divided as follows: January, 2 cases; February, March, and April, no cases; May, 1 case; June, 3 cases; July, 63 cases; August, 125 cases; September, 75 cases; and deaths as follows: In July, 4; August, 17; and September, 12. It is estimated by the department of health that the probable recoveries will be about 40 per cent of the cases affected.

When the number of cases reached the hundred mark the department of health of the city of Buffalo communicated with the New

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York State department of health, who in turn requested Dr. Rupert Blue, Surgeon General of the United States Public Health Service at Washington, to aid us in fighting this epidemic. The Federal authorities immediately sent to us Dr. Wade H. Frost, passed assistant surgeon, and later sent Asst. Surg. Leake. A few days later Dr. Simon Flexner, of the Rockefeller Institute of Medical Research, of New York City, asked if we had any objection to the institute sending one of their men here to study the epidemic. I certainly was very glad to advise him to send his man along, and two or three days later Dr. Frank Fraser, clinician, connected with the Rockefeller Institute, came to Buffalo. He made a most thorough study of the disease, making examinations of various patients, taking washings from their noses and throats, and sending same to the institute to be injected into monkeys. We have received no definite report as yet on the result of his experiments, with the exception of the fact that one of the monkeys was developing symptoms simulating those observed in poliomyelitis. Dr. Flexner no doubt will be able, either at this time or a little later, to give you more definite information as to his investigations.

In a short time circulars were distributed to parents whose children were afflicted with this disease, instructions and circulars were distributed among all the physicians of Buffalo, and a meeting was held in the common council chamber in the city and county hall, Buffalo, where men of eminence who had studied this disease not only in Buffalo but in various parts of the country delivered lectures on the epidemiology, symptomatology, etiology, and prophylaxis of this disease, and several cases of children afflicted were exhibited and their cases discussed. This meeting was attended by over 500 physicians and the laity who were interested in this dreaded disease.

Much has been said about the possibility of transmission of the disease by dust, and at Los Angeles and other places the largest number of cases were found on dusty streets and roads.

The latter part of July, the entire month of August, and the early part of September in Buffalo were cold and rainy, the temperature being far below the seasonal average and the rainfall very much above the average for this season; in fact, we have not had a cooler summer or one in which we have had such a heavy rainfall for many years; hence the dust theory, as far as Buffalo is concerned, is somewhat dubious. We have looked at this matter from several viewpoints and our conclusion is that the season had no effect on the spread of the epidemic.

As to whether the fly, stable or domestic, is an agent or not in the spread of this disease, we are unable to say. In view, however, of the extensive campaign against flies we have waged

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during the past two or three years, though Buffalo is far from being a flyless town, the number of flies here this year was very small as compared with what it was in former years. Many cases have occurred where there was no barn in the vicinity and where *Stomoxys calcitrans* was not in evidence.

In fighting this epidemic, we have placarded houses, maintaining quarantine for three weeks, and required private funerals; we also set apart two wards at the Ernest Wende Hospital, this being the contagious disease hospital in Buffalo, for the isolation and treatment of poliomyelitis.

The department in its investigation, noticing a large number of cases of herpes zoster, required that all cases of herpes zoster, or shingles, be reported at the office of the department for observation and study in order to learn if there really was any connection between this disease and poliomyelitis. Poliomyelitis in the city of Buffalo occurred both in the rich and poor sections, starting in the closely populated Italian district.

This disease is now on the wane. A complete report of this epidemic, the observations made by the twelve men who have been detailed by the department of health of the city of Buffalo, together with the experts sent here by the United States Public Health Service, the Rockefeller Institute and the New York State department of health, will be published and sent to anyone on request.

Prof. FRANKL HOCHWART, Wien: Spricht vom klinischen Standpunkt von den verschiedenartigen Symptomencomplexe der (spinalen) Poliomyelitis zu verschiedenen Zeiten und in verschiedenen Ländern. Früher sah man in Wien kaum je Schmerzen, Blasenstörungen, Frühcontracturen bei diesen Fällen—nun sieht man solche häufig—bei den von Frankl Hochwart in Los Angeles beobachteten Fällen waren Schmerzen, jedoch keine Blasenstörungen. Frankl Hochwart obducirte übrigens einmal einen Fall, der dafür sprach, dass es eine isolirte Poliomyelitis der Blase gäbe.

Vielleicht wird uns die Bacteriologie diese interessanten Schwankungen aufklären.

Dr. KARL LANDSTEINER: Landsteiner macht darauf aufmerksam, dass man in Anbetracht der geringen Virulenz der von Pettersson in Sekreten gesunder Virusträger aufgefundenen, mit atypische Veränderungen hervorrufenden Virus vermuten sollte, dass diese Fälle der der Uebertragung der Krankheit eine geringer Rolle spielen als Kranke, während aus epidemiologischen Gründen vielfach das Gegenteil geschlossen wird.

Dr. WILLIAM S. THAYER, Baltimore: I should like to ask Dr. Rosenau if in his experiments he was able to form a definite opinion as to the incubation period of the disease in the six monkeys and as to

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the length of time the flies were kept before they were allowed to bite the monkeys. In the work which Dr. Pettersson has brought to our attention I am rather struck with the similarity between the seasonal relations of this disease as set forth and the seasonal relations of malaria, a disease known to be transmitted by a bloodsucking insect. It is striking that in the first half of the year, from January to June, cases of poliomyelitis are extremely rare. They began in May, reaching the number of 88, and in June 83. In July the number of cases suddenly increased, and the number reached its height in August, September, and October, falling off rapidly in the fall, although in November and December there are still a considerable number of cases. I must say it is rather strikingly like the curve of malaria, which we believe to be due to the bite of *Anopheles* in temperate climates. Of course, it is conceivable that the incubation period both in the fly and in the human being may be longer in colder regions, and while it would be hardly prudent to attempt to argue in favor of a hypothesis with regard to which we have only had a preliminary announcement, yet from the figures which have been presented we ought not to feel that it is not a possibility as yet, even in a cold climate.

Dr. ROSENAU: When we began the work last summer we tried all sorts of mechanical and other devices to have the flies bite the monkeys without injuring them or the flies, and this was not such an easy matter, as both are pretty lively. I will tell you a little trick which we have used, and which has served a good purpose, so that those who desire to repeat this experiment may find it useful. We simply wrap the monkey up in a little piece of chicken wire, with a mesh about three-quarters of an inch, wrapping him tightly but not hurting him, so that he can not move. Then you have him in a package and he can not do a thing. Put him in the cage, the flies find him, and in a little while the flies feed. When you think the monkey has been bitten enough take him out without disturbing the flies. At first we had three or four monkeys exposed at the same time, and almost all the flies would select one particular monkey, so that other monkeys would escape being bitten, or only be bitten by a few flies. Noting that fact, we went slowly in our experiments, so that now we expose one monkey at a time. The fly picks up the infection on the mouth parts of one monkey and carries it to the healthy monkey, the same as you would transfer infection with a hypodermic syringe.

As to Dr. Thayer's question, I can not answer it completely. I can only say that the shortest period which we can now give is about 21 days, as I remember it. I have not my notes with me. How much of that 21 days was in the extrinsic period of incubation in the fly and how much in the intrinsic period in the monkey I am unable

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to say, but by analysis of the figures I may be able to learn more about it. That, as well as many other points, we hope to work out.

Dr. ALFRED PETTERSSON, Stockholm, Sweden: Ich möchte zuerst daran erinnern, dass die Natur keiner Schablone folgt, und dass es vielleicht möglich ist, dass die Verbreitung der Krankheit auf verschiedene Weise stattfinden kann. In Bezug auf Schweden liegen die Verhältnisse aber so, dass wir das Uebertragen des Virus durch blutsaugende Insekten als Ursache der Entstehung und der Ausbreitung der Epidemien nicht annehmen können. Wie von Geh.-Rat Löffler schon hervorgehoben worden ist, fing die Epidemie in Gothenburg Ende des Sommers 1911 an, erreichte eine bedeutende Höhe aber erst in November, Dezember und Januar und fuhr sodann den ganzen Winter fort, also während einer Zeit, da die blutsaugenden Fliegen in Schweden sich im Winterschlafe befinden. Ich kann mehrere Beispiele für des Erscheinen der Krankheit im Laufe des Winters geben. Im Monate Dezember des vorigen Jahres wurden mehrere Fälle in der Gegend von Kalix, hoch oben in Schweden ungefähr auf dem 66sten Breitengrade, gemeldet. Zu dieser Zeit ist dort alles von Eis und Schnee bedeckt, und die Kälte beträgt wohl im allgemeinen mehr als — 10° C. Es leuchtet sofort ein, wie weit verschieden die Bedingungen hier in der Natur waren von den von Prof. Dr. Rosenau experimentall geschaffenen, bei welchen er für das Gelingen der Infektion der Affen eine grosse Menge Fliegen und sehr günstige Lebensverhältnisse für sie nötig hatte.

Die Epidemie von 1911 fing schon zu Ende des Monats März und im Anfang April, zum Teil in den nördlichsten Teilen Schwedens, an. Zu dieser Zeit ist das Insektenleben dort noch nicht wieder erwacht. Um mit den Fliegen als Ueberträgern zurecht zu kommen, müsste man also eine Inkubationszeit der Krankheit von mindestens sechs Monaten annehmen. Beobachtungen, die für eine gemacht worden. Zu diesen schwerwiegenden Bedenken kommt noch der von mir schon hervorgehobene Umstand, dass ein Uebertragen durch blutsaugende Insekten, nach den bei den experimentellen Forschungen bisher gewonnenen Erfahrungen, das Vorkommen eines akuten Falles voraussetzt. Ich glaube somit nicht, dass das Auftreten und der Verlauf der Epidemien in Schweden sich durch diese Uebertragungsweise erklären lassen. Vielleicht sind aber die Verhältnisse in Amerika andersartig.

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JOINT SESSION OF SECTIONS V AND VII, FRIDAY MORNING, SEPTEMBER 27, 1912.

THE MUNICIPAL AND STATE CONTROL OF PLAGUE IN JAPAN

Prof. S. KITASATO, M. D., F. R. S. (London), Tokyo, Japan.

INTRODUCTION.

Plague never existed in Japan until it was brought by ships arriving from various ports in southern China and India, where it had prevailed for a long time. Eleven cases were detected from 1896–1899, on board ships coming from Bombay, Hongkong, and Formosa. In November, 1899, the first case of plague appeared in Kobe. The disease prevailed among rats and men, first in that city, and then spread into Osaka and other parts of the country. Another strain of the germ was brought by a ship to Yokohama in 1902, which caused an epidemic in Yokohama and Tokyo. In Osaka, the epidemic reached its climax in 1907, and in Kobe, in 1909, and it spread into other parts of the country. From 1899 to 1910, 2,524 cases, with 2,076 deaths, occurred in the whole of Japan. It was completely subdued by the end of 1910, on account of the exertions made by the central, local, and municipal governments. Excepting in Formosa, no new case has appeared since 1910. The yearly report of cases and deaths is shown in the following table:

TABLE No. I.— *Yearly report of cases and deaths of plague.*

	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	Total.
Cases	62	169	3	15	58	1	285	497	646	351	388	49	.....	2,524
Deaths	44	153	3	10	50	1	219	386	574	281	314	41	.....	2,076
Percentage of deaths	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	82.2

I. MEASURES FOR THE PREVENTION OF PLAGUE.

A law regulating the prevention of infectious diseases was for the first time issued in 1897, and amendments were made in 1907. It provides that the work of prevention should be made with the municipal expenses, but shall be superintended by the ken (or provincial) government. The superintending ken governments shall have a committee for detection of epidemic diseases organized under the police department, and shall appoint the chief and the members of the said committee, which consists of qualified physicians and policemen. If necessary, branch offices may be opened in the county governments, the members of which are also nominated from among physicians and policemen. These branch offices execute their work in connection with the ken governments. Again, each municipality is to

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have a permanent board or committee for promotion of the sanitary condition of the place. They cooperate in the prevention of epidemic diseases whenever they prevail.

These are the legal measures we have for the prevention of general epidemic diseases. Plague, however, bears such a serious relation to the national welfare in general that it can not be left to the control of the local governments. The Imperial Japanese Government organizes a temporary committee for the prevention of plague epidemics; appoints managers, inspectors, vigilance officers, and secretaries; and enlarges the office of prevention established in the ken government. Moreover, such specialists, Government officials, business men, and others as are deemed necessary for the proper execution of the preventive measures are appointed to be consulting members. For example, in the year 1905–1907, besides 11 managers, 49 inspectors, 18 secretaries, 85 vigilance officials, and 30 employees, 14 consulting members were appointed in Osaka, while in Kobe 9 managers, 16 inspectors, 35 secretaries, 56 vigilance officials, 56 employees, and 11 consulting members were employed in 1909.

In the central sanitary bureau of the department for home affairs sanitary experts and managers of epidemic prevention are appointed, who superintend sanitary work and especially the work of preventing epidemic diseases. They direct and superintend the work of the local committee when plague appears in any part of the country. The Imperial Institute for the Study of Infectious Diseases maintains the plague laboratory, in which the study of plague is made all the time. The institute not only affords the Government with the necessary scientific advice and the antiplague serum and vaccine, but it provides the experts to direct the work of prevention.

In order to check the invasion of plague and other epidemics from abroad, the quarantine regulations were issued in 1899. Harbor offices were established at Kakanagawa-ken (Yokohama), Hiogo-ken (Kobe), Nagasaki-ken (Nagasaki), and Fukuoka-ken (Moji), in 1900. They consist of the harbor medical officers, assistant harbor medical officers, medical inspectors, and inspectors. They make medical inspections of ships and issue orders for the quarantine and disinfection of infected ships.

Besides these Government measures, private medical and lay associations for safeguarding the public health are also organized in each municipality. They help to give the public the necessary information relating to the work of prevention; help in the execution of the functions of the Government establishments, and in facilitating the execution of the plans and resolutions of the committee. They give general instruction in the nature of plague prevention; lend encouragement to the extermination of rats; assist in the medical inspection of the inhabitants; collect contributions; and instruct hose who are to engage in the actual work of prevention.

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Still further amendments in the organization of the section of epidemic prevention were made this year (1912), which provide that 17 managers and 69 assistant managers are to be appointed by the home department, who are to be stationed at the center of ken governments, where they are to engage in the work of prevention of epidemic diseases under the direction of their respective governors. At present, managers are stationed at 3 fu and 8 ken, and assistant managers at 3 fu and 20 ken. This amendment was adopted in consideration of the importance of checking epidemic diseases antecedent to the appearance of any victims.

II. SYSTEM OF PREVENTION.

Rats have hitherto played the most important rôle in plague epidemics in Japan, and consequently a complex system is provided to eliminate them. The prevention of the importation of the germ, the preservation of cleanliness, the extermination of rats, the bacteriological examinations, and like measures, are constantly carried on. On the appearance of a case of plague, either in rats or in man—the discovery of animal or human cases—disinfection, encouragement of rat catching, repairs of the banks of harbors and rivers, contrivances necessary to prevent rats from infesting houses, warehouses, and other buildings, and like measures are enforced. The following especially are some of the most noteworthy expedients adopted in Japan:

A. MEDICAL INSPECTION OF SHIPS.

From 1894, all ships coming via plague-infected ports were subjected to special inspection until 1899, when the regular quarantine regulations were issued. During the interval of time from 1896–1910, 37 cases were found in 30 ships, as is shown in the following table:

TABLE No. II.—*Cases of plague detected at seaports (1896–1910).*

	Kobe.	Yokohama.	Nagasaki.	Kuchinotsu.	Moji.	Total.
Number of ships in which plague was detected.	8	8	11	1	3	31
Number of cases	8	9	14	1	5	37

No cases which passed through the ports unobserved have developed on land, but it has been demonstrated that the germ has been imported through cargoes coming from India, Hongkong, and Formosa. The reason was attributed to the fact that the rats carrying the germ have come ashore with such cargoes. In consequence of this discovery, ships coming from places where plague is present, are required to undergo rat-extermination processes and thorough disinfection. Filth and trash affording places of refuge are consumed with fire. The rat-extermination processes are performed with the Nocht-

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Giemsa's apparatus. At Kobe, from 1906–1910, the following results were obtained:

TABLE No. III.—*Results of the rat-extermination processes (Kobe).*

	1906	1907	1908	1909	1910	Total.
Number of ships	28	64	77	151	137	457
Number of rats killed	1,169	2,292	2,510	3,931	1,667	11,569
Plague rats	.....	.....	.....	1	4	5

The above table shows that, during the five years, 11,569 rats were killed in 457 ships treated with the apparatus, 5 of which were found to be infected with plague.

There is liability of the transportation of the germ, not only from abroad, but also from port to port within the country. Hence the law requires that all ships under the Japanese flag shall be subjected to the rat-exterminating processes at the time of yearly inspection.

Ships in which either human or rat plague has appeared are thoroughly cleaned, especially of rats, in the same way as is done in a plague-infected house. Twelve ships were cleaned at Kobe during the years from 1899–1910. They were all liners from abroad or ships from Formosa. Medical inspection, rat extermination, and disinfection of ships are essential in checking the introduction of the germ from abroad, as well as in preventing its spread within the country.

B. INVESTIGATION OF HUMAN AND RAT PLAGUE.

The detection of cases is the most important matter in the prevention of infectious diseases. Reports sent in from physicians and the families of the patients do not satisfactorily answer this purpose, especially when the nature of plague is considered; (i. e., the difficulty in establishing diagnosis and the sudden death with which it terminates). A complex system of prevention should be instituted. So the authorities have adopted the following procedure on the appearance of an outbreak: 1. Medical examination of inhabitants; (2) inspection of individuals; (3) demand that both physicians and the public send in reports of cases of acute diseases; (4) examination of corpses. It has brought about satisfactory results in the detection of cases. The following table shows the results obtained in Osaka-Fu and Hiogo-Ken:

TABLE No. IV.—*Detected cases.*

	In Osaka-Fu (1899–1910).	In Hiogo-Ken (1899–1909).
Total number	1,119	758
Physician's reports	578	409
Reports from the public	58	17
Medical inspection	264	272
Examination of corpses	137	60
Medical inspection of the inhabitants	87	10

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The large number of cases of plague detected by physicians is due to the advancement of their knowledge, gathered by repeated contact with it through so many years. The results from the examination of dead bodies constituted one of the most important factors in the discovery of cases.

The discovery of plague in rats is far more difficult than in human cases. For this purpose, rats are caught at the time when thorough cleaning and disinfection of houses are made, or by rat-exterminating detachments. They are also purchased. The examination of as many rats as possibly can be collected serves to disclose the presence of the germ. Unfortunately, the place of capture was formerly often obscured, and, to provide against this difficulty, the rat purchasers were sent in some places from house to house, and thus the exact place of capture was ascertained. For reference, I will quote here one item from the report made by the Hiogo-Ken government. It includes the space of time from 1899–1910. The total number of rats examined during these 12 years amounted to 5,294,847, of which 9,576 were found to be infected. The following table shows the various sources from which plague rats were collected:

TABLE No. V.—*Number of plague rats collected from various sources (per 10,000) in Hiogo-Ken from 1899–1910.*

Purchased	15.1
Collected at cleaning	36.9
Collected at disinfection	330.9
Collected by the detachments	23.3
Average per cent.	18

The largest number of plague rats were collected at the time of disinfection, because this is the measure applied to the most deeply infected areas. Again, the paucity of plague rats among the purchased ones is due partly to these forming the majority of the collections and partly to the fact that they also include those collected during the period intervening between epidemics. The examination of rats discloses the points of entrance and of distribution of the germ, and affords the most important hint from which the necessary measures of prevention can be drawn.

C. MEASURES TAKEN AFTER THE DISCOVERY OF HUMAN OR RAT PLAGUE.

The patient, when the diagnosis is established by bacteriological examination, is segregated in hospitals having special equipments for infectious diseases or in the temporary segregation hospital. The dead body is first disinfected, in order to obviate the possible chance of infection, and is then cremated. The house occupied by the patient and the neighboring houses are isolated and disinfected, and rat-extermination processes are applied to them. The members of the patient's family are held for 10 days in the detention house. They are examined twice daily by the physicians. The inhabitants of the

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neighborhood are also examined by the physicians, just like the members of the patient's family.

The house in which a plague rat has been found is also isolated along with the neighboring houses, in like manner as when a human case is found. The rat-extermination measures and medical examination of the inhabitants are both enforced. The isolation is superintended by policemen. A still larger zone surrounding the "dangerous" zone is marked out as a "precaution" zone, where rat-extermination measures are applied, and the inspection of inhabitants is made; for the infected rats may migrate into distant places. Instances are not few in which human and rat plague have appeared in these "precaution" zones.

Patients admitted into the segregation hospitals are treated at public expense. They have been nearly all bubonic cases, and consequently the excision of buboes, the injection of antiplague serum, and other rational methods of treatment have been applied. Unfortunately, only half of the total number of cases have been admitted into the hospitals, the remaining ones having been discovered after death, or having died immediately after the diagnosis was established. In Hiogo-Ken, for example, 785 cases occurred, of which only 386 were admitted into hospitals. Further, 162 of the 386 who entered hospitals recovered, the mortality in the hospital being 58 per cent.

D. EXTERMINATION OF RATS.

Except pulmonary plague, epidemics of all forms of plague bear an intimate relation to rats. Each time the epizootic precedes the epidemic, and consequently an attempt has been made to exterminate rats in order to hinder them from coming in contact with human beings. Our Japanese houses are far less convenient than those of the Occident for effecting the destruction of rats. The rebuilding of rat-proof houses would seem to be an ideal measure, but it is impracticable from an economic standpoint. The method hitherto adopted consists in the purchase of rats, the encouragement of killing them with poison and traps, and, if necessary, the organization of rat-extermination detachments. In Tokio, Yokohama, Osaka, and Kobe rats are purchased independently of an epidemic or epizootic of plague. In 1911, 1,464,708 rats were purchased in Tokio alone. This is equal to 4.1 rats per family. In Kobe, 4,632,363 rats were purchased during the time from 1899–1910, the highest yearly amount reaching to 758,956 (1908).

1. *Purchase of rats.*—In those places that have frequent intercourse with plague-infected places the purchase of rats and the encouragement of rat killing are enforced at public expense. The price varies greatly with the time and locality. The average price is 3–5 sen. During epidemics prizes are offered to be distributed by lottery. It

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is one of the most successful methods for the destruction of rats. The large majority of rats collected are those that are purchased.

2. *Distribution of poison.*—This measure is taken only during the epidemics. Inspectors or other members of the committee alone are allowed to handle it, for it contains arsenic. Rats will die within 4 to 30 hours after taking 0.0005 grain of arsenic, independent of their body weight. It is mixed with the food that rats like best. Of course occasional changes in the food bait must be made to effect satisfactory results. It is distributed with good results, not only at the time of the rat-extermination processes, but also at that of general cleaning.

3. *Rat-extermination detachment.*—This is an establishment organized at each outbreak of plague anew. It consists of a superintendent, with some laborers and carpenters. They are sent to houses and warehouses in which rats are likely to congregate, to kill rats, and insure preventive measures against their reentering. They endeavor to hunt up the dead and the living, and repair the building so as to exclude rats. They have brought about good results.

4. *Encouragement of keeping cats.*—Besides the above-mentioned artificial measures of eliminating rats, their natural enemy—the cat—should not be disregarded. Since 1908, inhabitants of the municipalities that have been scared by the infection are encouraged to keep cats. The sanitary association of each locality is requested to foster the custom. It takes the trouble to buy cats from other places, to be given to the inhabitants on application, and sometimes food for such cats has been also supplied by the association. In consequence of such measures, the number of cats in the regions formerly infected increased from 1 in every 12 families, in September, 1908, to 1 in every 9 families in March, 1910. Cats catch rats continually all the year around, and therefore are efficacious auxiliaries in the extermination of the rodents.

E. PREVENTIVE MEASURES AGAINST THE PROPAGATION OF RATS.

Besides the destruction of rats, the application of preventive measures that will deprive them of facilities for living and propagating are necessary. The following are some of the measures that have been carried out:

1. *Rat-prevention contrivances along the banks of harbors, rivers, and trenches.*—The banks of these waterways abound in holes and crevices in which rats may live and thrive. *Mus decumanus* likes such habitats, and his straying about from them is likely to disperse the germ. The holes, therefore, should be filled with sand, and then closed with mortar consisting of 2 parts of cement, 1 part of chalk, and 10 parts of sand. At Kobe 12,249 feet of harbor banks and 921 feet of trench banks have been treated with this method. The larger channels for drainage have been changed into a closed system, while 107,537

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feet of the banks of smaller channels have been concreted. In many other places this method has been tried with the most efficacious results.

2. *Rat-prevention measures in houses and warehouses.*—Formerly the galvanized-iron fence around the place where a human or an animal case of plague had been discovered was removed as soon as the disinfection of the place had been completed; but it was found necessary to leave it for a longer period of time in order to effect not only the complete destruction of rats inside the area, but also to prevent the reinvasion of such an area. In Osaka and Kobe the inhabitants of the locality in which a case of plague, either human or rat, has been found, are required to construct a rat fence around it at their common expense and around the place more deeply infected a permanent rat fence is built at municipal expense. The inhabitants form rat-prevention committees to protect such rat fences.

F. RAT EXTERMINATION, DISINFECTION, AND CLEANSING.

The disinfection and cleansing of plague-infected houses should be made chiefly with a view to exterminating rats in them, and therefore the processes are carried out after the attack on rats has been made with poison and traps. Either human or rat plague houses and neighboring places where the infection is suspected are disinfected. Phenol, sublimate, and quicklime are the chief disinfectants used in these cases.

The cleansing is effected twice a year all through the country, and at such times rats are eliminated beforehand, especially in the regions where plague is likely to be imported. The destruction of rats is first made within the region where disinfection is to be carried out before the cleansing is made. At the time of a great epidemic the destruction of rats and cleansing are made, not only at municipal but also at national expense. By such measures the epidemics have been soon brought under control. The filth gathered during the processes of disinfection and cleansing is burnt to avoid the spread of the germ. This kind of cleansing is applied not only to residences, but also to warehouses, factories, landing places, markets, railway stations, etc. The results obtained in Kobe from 1908 to 1910 are as follows:

TABLE NO. VI.—*Results of rat extermination and disinfection at Kobe.*

	1908	1909	1910
Disinfection:			
Number of houses	5,927	8,196	1,251
Number of rats killed	3,849	7,911	701
Cleansing:			
Number of buildings	111,096	127,192	33,979
Number of rats killed	13,628	7,984	18,249

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The above table shows how many houses and other buildings were cleansed and how many rats caught. The number of plague rats found among them was given in Table No. V.

The rat elimination and cleansing of ships in the harbors have been referred to in the previous paragraph.

G. LAWS REGULATING WAREHOUSES, RAGS, AND OLD COTTON.

Corn and cotton imported from the infected regions may hold the germ, and therefore laws regulating the warehouses, rags, and cotton have been enacted. This law provides that the foundations and the walls of warehouses should be so constructed as not to allow rats to pass through them. Holes through which rats may pass are to be closed, and the rat-elimination and cleansing processes are to be carried out whenever they are considered necessary. Rags, old cotton, and like goods are easily infested, and the rats like to congregate in such articles. We have had indisputable evidence of the germ having been imported with them. Consequently the importation of rags, old cotton, and like goods from the infected regions is prohibited, and the transportation and sale of rags, cotton, and such goods already in the country, but under suspicion of being infected, are prohibited, unless they are thoroughly disinfected.

III. EXPENSE OF OPERATION.

Our law regulating the prevention of epidemic diseases provides that the expense of prevention should be paid by the municipalities. The expense of the special contrivances is paid by the ken government, while one-sixth of the whole cost is paid from the national treasury. But plague epidemics bear a serious relation to national traffic and commerce, and should be subdued at the site of importation (e. g., Kobe, Osaka, and Yokohama) before they spread into the interior of the country. Prevention, therefore, should not be left to the control of the municipalities where the epidemic breaks out. Moreover, it comprises expensive measures for eliminating rats, as, for example, arrangements along the banks of the harbors or other waterways and about warehouses and other buildings. The expense is so great that neither municipal government nor individuals can afford it. So an exception to the law regulating the prevention of general epidemic diseases was made in the case of plague. In such case it is provided that the larger share of the expense involved is paid out of the national treasury. The prevention establishment is organized by the National Government and the salaries and other expense are charged to the national treasury. The arrangements for the banks of the harbors and rivers are built at national expense, and the share of the rat-prevention arrangements falling upon individual houses is paid by the government.

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During the epidemic in Kobe and suburbs, from 1899 to 1910, 1,511,568 yen was paid by the national, ken, and municipal treasuries, 349.385 yen of the total sum was paid by the national treasury, 268.511 yen by the ken government, and the remaining 893,673 yen by the municipalities.

In Osaka more than 3,165,000 yen was expended in all. Plague epidemics bring not only serious damage to industry and commerce, but also great distress to the inhabitants within the area of the outbreak, for they are forced to expend a great amount of money. Such damage and distress have been fully compensated; for the deeply infested germ has been at last eradicated by the collaboration of the authorities and the public, not only to the blessing of the inhabitants of the infected regions, but also to that of the whole nation.

IV. IMPROVEMENTS PROPOSED IN THE PREVENTION OF PLAGUE.

Methods for the prevention of infectious diseases should, of course, be improved according to the advancement made in scientific knowledge. Especially is this the case with plague. Often the method of prevention has been amended. For example, at the beginning of the first epidemic, going about barefooted was prohibited, on account of the apprehension of cuticular infection; and the extreme measure of burning infected houses was adopted. These methods have been abandoned. The antiplague serum is now given to the patient, while the people who have been segregated from the houses in which either human or rat plague existed are inoculated with the serum or plague vaccine. When a fierce epidemic breaks out, the inhabitants of the whole village may be treated with the prophylactic inoculation, which restrains the spread of the disease. This prophylactic treatment will bring about an ideal result, but the more radical measure of prevention consists of the elimination of the source of infection, the rat; for plague is an infectious disease, not primarily of human beings, but more properly of rats. In 1906 the Indian Committee on Plague Prevention discovered the fact that fleas may play an important part in distributing the plague germ. In Japan the same train of study as to the relation of plague and the flea was also carried out. The flea theory of the Indian committee was verified at Yura, Awaji, in 1908. Later on, at Kobe, the same line of investigation was pursued with intermissions, and still the same theory was found to receive support. In a previous communication[1] made by the author, the commonest native rat flea of Japan was reported to belong to the family of Ceratophylus and *Ctenopsylla musculi*. From further examinations made in Kobe since 1909, the same results have been obtained. They are few in number in midsummer, and gradually increase from September on. They reach the highest numbers in

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January–April, and gradually decrease from May on. In August they decrease to the lowest numbers. The imported rat flea, *Xenopsylla cheopis*, appears in August. Their number gradually increases and reaches the highest point in November. Then they decrease until they disappear in March. The result of bacteriological examination with fleas shows that *X. cheopis* carries the germ most abundantly, while Cerstophylus stands next to it, and *C. musculi* is last. Human, dog, and cat fleas have been collected, though in small numbers, from the bodies of rats. No germ has been found in them. The following table shows the intimate relation that exists between the rat flea and the epidemics. The experiment was made in Kobe during the epidemic of 1909–10. It consisted in letting guinea pigs go free in houses, ships, and other buildings.

TABLE No. VII.—*Results of experiment with guinea pigs (1909–10) at Kobe.*

	Plague houses or their neighbors.	Infected regions.	Warehouses for flaxen and straw bags.	Liners bound abroad.	Warehouse.
Number of houses or places	259	101	232	15	94
Number of guinea pigs employed	921	307	617	169	423
Number of the experimental guinea pigs that contracted plague	10	4			
Total rat fleas collected	487	377	57	[a]50	[b]71
Infected fleas	95	63	4		

[a] All *X. cheopis*. [b] 55 *X. cheopis*, 16 Ceratophylus.

The above table shows the fact that the fleas in the house in which plague existed and in its neighboring houses carry the germ most abundantly (19.5 per cent) and the region surrounding them is also considerably infected (16.7 per cent). In the warehouses in which flaxen bags, straw bags, and such material had been stored, and in which no case of either human or rat plague had been present, infected fleas were found. This fact will give an important hint as to the future prevention of plague. The following results have been obtained from the examination of the guinea pigs. They were let loose in the house in which either human or rat plague existed after 6 to 10 days from the date of disinfection.

TABLE No. VIII.—*Experiment with guinea pigs, which were let loose in the plague houses after disinfection was made.*

Number of plague houses	42
Number of guinea pigs employed	135
Number of guinea pigs contracting the disease	2
Total fleas	304
Infected fleas	45

This shows that the common disinfection may destroy plague bacilli, but that it has nothing to do with the fleas. They remain unhurt

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following conclusion after a series of experiments carried out in the Imperial Institute for the Study of Infectious Diseases:

The production of prophylactic efficacy against the pulmonary plague in guinea pigs was brought about by various preparations of the vaccine. In the guinea pigs inoculated with dead bacillus from the bouillon and agar culture and the nucleoproteid vaccine, only a slight production of prophylactic efficacy against pulmonary plague was observed. The living attenuated culture, however, produced a high prophylactic efficacy. Ten guinea pigs receiving the living attenuated culture were made to contract pulmonary plague. Seven of them were saved. This method can not yet be applied to the human body, for inoculation loss is sometimes met with. Prof. Shibayama succeeded in promoting the prophylactic efficacy with the living attenuated culture after the animal got a certain degree of immunity with the inoculation of the dead bacillus from the agar culture; or after it received the mixture of the living attenuated culture and the serum. Since this method has been proved to develop a digh degree of immunity in animals with safety, it may be applied to individuals at the time of a severe epidemic of pulmonary plague, like the one we encountered in Manchuria. The treatment of pulmonary plague is yet to be investigated. The knowledge we have acquired up to date has been almost wholly of the bubonic plague, and much of the study of the pulmonary plague remains still to be made. The treatment of pulmonary plague proves futile, if it is not applied to the patient at a very early stage of infection, for the disease terminates very quickly.

[1] Die Pest in Japan, by Prof. Dr. S. Kitasato; Zeitschrift für Hygiene und Infektionskrankheiten, Bd. 64, S. 279, 1909.

DIE EPIDEMIOLOGISCHEN BEOBACHTUNGEN ANLÄSSLICH DER PESTSEUCHE IN DER SÜD-MANDSCHUREI, UND ZWAR IM KAISERLICH-JAPANISCHEN VERWALTUNGSDISTRIKTE.

Dr. N. Murata, Regierungs-Medicinalrat des kaiserlich-japanischen General-Gouvernements in Kuantung, Port Arthur.

Die Lungenpestepidemie 1910–11 in der Süd- und Nordmandschurei war die schrecklichste in den letzten Jahrzehnten. Die Epidemie breitete sich über einen Raum von etwa 240,000 englischen Quadrat-Meilen aus, und die Zahl ihrer Opfer betrug ungefähr 40,000. Obwohl der Verlust in der der Südmandschurei-Eisenbahngesellschaft gehörenden Gegend und in der Provinz Kuantung verhältnismässig gering war, zählte man doch 228 Tote. Die Ausgabe der japanischen Regierung für die Bekämpfung der Seuche beläuft sich auf 1,720,000 Yen und die der betreffenden japanischen Gemeinwesens auf 876,000 Yen. Ausserdem dürfte auch die Ausgabe der chinesischen und russischen Regierung nicht unbedeutend gewesen sein.

Ferner wurden der Handelsverkehr und jegliches Gewerbe erheblich gestört und auch vernichtet.

Über diese Epidemie will ich meine Beobachtungen in unserem japanischen Distrikt kurz zusammenfassen:

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I. ZUSTAND DER AUSBREITUNG DER SEUCHE.

In der letzten Woche des Oktobers 1910 brach die Pest in der Nähe der Mandschurei Station (Ost-chinesische Eisenbahn der russischen Regierung) aus und wurde in kurzer Zeit nach dem Süden hin in Charbin eingeschleppt. Bis zum 2. Dezember desselben Jahres wurden 462 Chinesen und 11 Russen von der Seuche befallen.

Während die Pestepidemie zunächst in einigen Orten noch nicht ganz erloschen war, begannen Tausende von Kulis in der Shantung- und Chili-Provinz, welche in die Nordmandschurei eingewandert waren, am Ende des Jahres die Rückreise nach dem Süden in ihre Heimat anzutreten. Die Anzahl derartiger Passagiere in der nördlichsten Station Changchun (Südmandschurei) errichte täglich 700–1,000, ausserdem war die Zahl der Fussreisenden kaum geringer Diese Kuligruppen verbreiteten die Pestkeime immer weiter und weiter, wohin sie kamen. Sie waren schon vorher in den nördlichen Provinzen angesteckt und hatten im Inkubationsstadium ihre Reise angetreten. Auf diese Weise verbreiteten die Fussreisenden die Seuche in Hulan, Pinchow, Petona, Chilin, Fukumen, Shinminfu u. s. w., während die mit der Eisenbahn Fahrenden die Ansteckung an der Ostchinesischen- (russischen) Süd-Mandschurischen (japanischen), Nordchinesischen (chinesischen Bahn entlang und in deren Umgebung vermittelten. Kurz darauf wurden in der entfernt gelegenen Provinz Shantung und in der Nähe von Chefoo Pestfälle aufgefunden.

In unserem Verwaltungsdistrikt wurden erst am 31. Dezember 1910 2 Kulis, die von Charbin in Changchun ankamen, und dann den Zug nach Dairen bestiegen hatten, in der Nähe von Hanchiatun, 18 Meilen von Changchun entfernt, während der Fahrt von dem Arzt als Pestkranke erkannt. Infolgedessen wurden sofort 149 Mitreisende wieder nach Changchun zurückgeschickt und dort isoliert. Kurz darauf wurden unter diesen Isolierten hintereinander verschiedene Pestfälle festgestellt. Inzwischen wurde auch in Dairen ein Kuli, der von der Nordmandschurei zurückreiste, von der Pest befallen (am 4. Januar 1911). In der Nordmandschurei brach nun die Seuche an verschiedenen Orten nach und nach aus, und betrug die Anzah der Fälle 228.

Bei dieser Pestepidemie wurden nahezu alle von der Lungenpest befallen, während nur in Changchun ein Fall von Bubonenpest vorkam. Daher kam es auch, dass keiner der Angesteckten am Leben erhalten werden konnte. Die meisten Kranken waren chinesische Kulis und unter ihnen nur 19 Coreaner, die mit den Chinesen zusammen gewohnt hatten. Ferner wurden ein englischer Arzt in Mukden

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der von chinesischen Regierung angestellt war, ein japanischer Arzt und dessen Frau von der Seuche befallen und dahingerafft.

Es soll wissenschaftlich sehr interessant sein, dass ein Schosshund (in Changchun) und zwei Esel (in Fushun) an einer Krankheit starben, die anatomisch-bakteriologisch als Pestpneumonie festgestellt wurde.

Wenn manche Autoren auch in Bezug auf den Ursprung der diesmaligen Epidemie annehmen wollen, dass die Seuche, welche seit Jahrzehnten unter den Tarbaganen (Arktomys bobac) im Baikalgebirge ihren Herd hatte, von diesen Tieren auf die Menschen übertragen worden war, so fehlt es doch leider an der wissenschaftlichen Begründung dafür. Dennoch liegt dieser Gedanke so nahe, dass er der Wirklichkeit entsprechen könnte.

Ueber die Tarbaganenpest soll späterhin der Bericht der russischen und chinesischen Forscher, welche anlässlich des Kongresses der im April 1911 in Mukden eröffneten internationalen Pestbekämpfungsversammlung mit deren Erforschung beauftragt wurden, veröffentlicht werden.

II. DIE ORGANISATION DER BEKÄMPFUNG DER SEUCHE.

Unser Verwaltungswesen in der Provinz Kuantung und in der Südmandschurei-Eisenbahn gehörigen Gegend ist ausser der Armée und Marineverwaltung das General-Gouvernement und die Südmandschurei-Eisenbahngesellschaft.

Es sollte also, falls irgendwo eine Infektionskrankheit ausbräche, aus Beamten und Mitgliedern der Gesellschaft ein Komité, das sich der Bekämpfung der Seuche widmen sollte, gebildet werden.

Bei der hier beschriebenen Epidemie wurde auch das erwähnte Komité gebildet. Da die Seuche aber nach und nach stärker auftrat, und auch die Gefahr für die Einwohner in dem Verwaltungdistrikt drohender wurde, wurde sofort eine temporäre Bekämpfungshauptabteilung in Port Arthur, wo sich das General-Gouvernement von Kuantung befand, errichtet, die nachher wegen der wichtigen und notwendigen Beratungen mit der chinesischen Regierung über die Bekämpfung der Seuche, nach Mukden, dem Sitz der chinesischen Zentral-Regierung in der Südmandschurei, verlegt wurde. Verschiedene Zweigabteilungen wurden in Changchun, Teli, Mukden, Rioyang, Inkawo, Antung, Dairen und Port Arthur eingerichtet.

Als die Seuche dann nach und nach zurücktrat, wurde die Hauptabteilung am 21. April 1911 nach Port Arthur verlegt und dann am 31 März 1912 aufgehoben.

Bei der Epidemie waren zeitweilig 69 Aerzte, 29 Assistenten, 414 Polizeibeamte und ungefähr noch weitere 2,000 Personen tätig.

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III. BEKÄMPFUNGSWESEN.

Die bei dieser Epidemie gebildeten Haupteinrichtungen, die unsere Bekämpfungsabteilung getroffen hatte, waren folgende:

a. Die Ueberwachung der Eisenbahnwagen, der Stationen und der Fussreisenden.

b. Die Quarantaine.

c. Die Errichtung der Isolierhäuser.

d. Die ärztliche Hausdurchsuchung.

e. Die Vertilgung der Ratten.

f. Die Desinfection.

1. *Die Ueberwachung der Eisenbahnwagen, der Stationen und der Fussreisenden.*—Es wurde berichtet, dass die Seuche bald nach Süden hin vordrang und Mitte November 1910 schon in Charbin eingeschleppt wurde. Die Stadt Charbin ist nur 9 Stunden (Eisenbahn) von Changchun, der nördlichsten Station in der Südmanschurei, entfernt. Obwohl es am zweckmässigsten gewesen wäre, dass man die Fahrt der Kulis, welche schon vorher von der Pest befallen und im Inkubationsstadium fortgereist waren, streng verhindert hätte, würde das Verbot jedoch sehr grosse wirtschaftliche Verluste verursacht haben, denn es war gerade damals die Zeit der Ausfuhr der Land- und Feldprodukte.

Bei der Ausführung der Bekämpfung beabsichtigten wir also möglichst die Formalitäten zu vermeiden und den günstigsten Erfolg zu erreichen.

Vom 25. November 1910 ab liessen wir die Aerzte ständig im Zuge mitfahren und daselbst die ärztlichen Untersuchungen der Reisenden durchführen. Ausserdem führte man vom 8. Januar 1911 ab auf jeder Station die ärztliche Untersuchung der Passagiere ein, denn die Seuche wurde in Charbin und denen Nähe immer heftiger, ja selbst in der Eisenbahn wurden Pestkranke aufgefunden und schliesslich brach die Seuche auch in Dairen aus. Da sich die Zustände in der Umgebung immer mehr verschlimmerten, wäre es sehr zweckmässig gewesen, die Kulis auf eine gewisse Zeit zur Beobachtung abzusondern und dann erst einsteigen zu lassen, nachdem sie als gesund befunden worden waren. Das liess sich aber nicht vollständig durchführen, da nicht sogleich genug Isolierhäuser vorhanden waren. Man suchte nun die Ausbreitung der Pest durch die Kulis zu verhindern, indem man ihnen die Benutzung der Eisenbahn bis zur Herstellung der Isolierhäuser aufs strengste verbot.

Aber dieses Verbot konnte den Verkehr der Kulis nicht ganz verhindern, denn die chinesischen Kulis Pflegen grosse Reisen zu Fuss zu machen. Anderseits schien auch das Verbot der Eisenbahnfahrt die Zahl der Fussreisenden vermehrt zu haben, so dass an den erforder-

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lichen Orten Ueberwachungsstationen errichtet, und der Reiseweg mit Gitterzäunen, Verhauen, Eisendraht, Zinkbrettern u. s. w. eingeschlossen wurde, um den Verkehr der Kulis unbedingt zu unterbinden. Vom 7. März ab schon war der Bau der Isolierhäuser vollendet, und die Benutzung der Eisenbahn wurde den Kulis nach 11tägiger Isolierung wieder freigegeben.

2. *Die Quarantaine.*—Zu der Provinz Kuantung gehören die freien Hafenstädte Dairen und Port Arthur. Dairen steht mit den chinesischen und europäischen Hafenstädten in regem Verkehr. Die Zahl der in diesen Hafen ein- und auslaufenden Dampfer beträgt täglich 15–20, ausserdem an Segelschiffen und Dschunken nicht unter 50–60.

Was den Hafen Port Arthur betrifft, so ist er nicht so gross wie der von Dairen, doch herrscht dort täglich ein reger Schiffsverkehr. In beiden Häfen wird die ärztliche Untersuchung gewöhnlich, wenn keine Seuche auftritt, der Seequarantaine gemäss ausgeführt. Ferner sind noch an der Küste mehrere kleine Häfen vorhanden, aber die hier ein- und auslaufenden Schiffe sind ausschliesslich nur Dschunken und Fischerboote. Hier wird es also in gewöhnlicher Zeit unnötig sein, die Quarantaine durchzuführen, und es werden die Schiffe nur einfach sanitätspolizeilich überwacht.

Im Oktober 1911 wurde aber berichtet, dass in Shanghai Pestkranke und Pestratten aufgefunden waren. Da nun unser Dairenhafen mit Shanghai in direcktem Verkehr steht, wurde sofort auf den Schiffen, die von dort ankamen, die Vertilgung der Ratten ausgeführt. Auch in der Umgebung des Hafens Dairen wurde die Rattenvertilgung unternommen und dabei mikroskopische Untersuchungen gemacht. Dies aber war nur ein Mittel der Prophylaxe gegen die Pestgefahr in Shanghai. Inzwischen hatte sich die Seuche in der Mandschurei immer mehr verbreitet und in Dairen waren auch Fälle von Erkrankungen vorgekommen, sodass sofort die Rattenvertilgung auf sämmtlichen einlaufenden Schiffen streng durchgeführt wurde. Vom 13. Januar 1911 ab wurde die Seequarantaine gegen die auslaufenden Schiffe begonnen. Wer von der Nordmandschurei herkam, und sich einschiffen wollte, musste, nachdem er während einer gewissen Zeit seinen Gesundheitszustand hatte beobachten lassen, sich einen Einschiffspass ausstellen lassen. Somit bemühten wir uns ernstlich, das Verschleppen der Seuche nach dem Auslande zu verhindern. Trotzdem trat die Seuche nach und nach in den Provinzen Chili und Shantung im Süden auf. Als sie dann von Mitte März ab bei Beginn des Eisganges an der Nordküste Chinas, wo der Verkehr der Dschunken und Fischerkähne immer lebhafter wurde, nach Norden überzugreifen schien, während sie sonst nach Süden hin fortschritt, wurden sogleich 79 Schiffsüberwachstationen

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an der Küste der Provinz Kuantung errichtet, und die Ankerung der Schiffe ausserhalb eines bestimmten Punktes streng verboten.

3. *Die Isolierbaracken.*—Wenn auch in unserem Verwaltungsdistrikt schon vorher einige Isolierbaracken errichtet worden waren, so konnte man doch nicht alle Kulis (die Fahrreisenden) aufnehmen, denn wir flegten nur die, welche in unserem Verwaltungsdistrikt hineinkamen, 7 Tage lang zu isolieren. Ausser der Isolierbaracken in Changchun, Mukden, Inkawo, Antung und Dairen wurden noch 23 weitere errichtet, welche 50–5,000 Personen unentgeltlich aufnehmen konnten.

4. *Die ärztliche Hausdurchsuchung.*—Bei der Bekämpfung der Pestseuche ist die frühe Entdeckung der Fälle unbedingt notwendig, besonders bei der Lungenpest, welche direkt vom Menschen zum Menschen anstecken kann. Es wurde ein Hausdurchsuchungskorps organisiert, welches aus Aerzten und Polizeibeamten bestand. Das Korps führte die Durchsuchung der einfachen Wohn- und Wirthäuser 1–2 Mal täglich durch, und wurden bei der Gelegenheit 50 Pestfälle, also 22 Prozent entdeckt.

5. *Rattenvertilgung.*—Obwohl die Rattenvertilgung bei der Lungenpestepidemie nicht so notwendig zu sein schien, während sie bei der Bubonenpestseuche ein unentbehrliches Schutzmittel ist, wurde sie doch in unserem Distrikt sehr angestrebt, denn Fälle von Bubonenpest wiederholten sich seit 10 Jahren in Inkawo, das in der Nähe unseres Distrikts liegt, und auch in Shanghai waren mehrfach Fälle vorgekommen. Die Vertilgung der Ratten wurde durch Ankauf und durch Ausschreibung von Preisen sehr gefördert, und zugleich deren mikroskopische Untersuchung vorgenommen. Von November 1910 bis Dezember 1911 wurden 169,025 Ratten angekauft und der mikroskopischen Untersuchung unterzogen. Unter diesen wurden aber keine infizierten Ratten vorgefunden.

6. *Die Desinfektion.*—Ausser den Häusern, in denen Pestkranke oder Todesfälle vorkamen, wurden alle diejenigen Personen oder Gerätschaften, welche mit dem Kranken in Berührung gekommen waren, einer chemischen oder physikalischen Desinfektion (Dampfdesinfektion) unterworfen. Die Durchführung der Desinfektion war für uns mit der grössten Schwierigkeit verbunden. Im Winter sinkt hier gewöhnlich die Temperatur unter −30° C. Infolgedessen gefrieren dabei alle Desinfektionsmittel schon vor Gebrauch bzw. der Berührung mit dem zu desinficierenden Gegenstand, obschon man sie vorher gekocht oder gewärmt hatte. Als wir sahen, dass alle Mittel eingefroren waren, und wir sie für wirkungslos hielten, beschlossen wir, die inficierten Häuser und Geräte zu verbrennen um einen neuen Ausbruch der Seuche zu verhindern. Den Bewohnern wurde der Preis der vernichteten Sachen sogleich ausgezahlt.

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IV. DIE BAKTERIOLOGISCHE BEOBACHTUNG.

Die Seuche verbreitete sich im Augenblick mit solcher Gewalt, wie wenn Stroh in Flammen aufgeht. Da nun die Zahl der an der Bekämpfung der Seuche beteiligten Personen nicht übermässig gross war, so dass sich ihr fast alle widmen mussten, konnten nur einige Personen unter uns die bakteriologische Untersuchung ausführen. Im folgenden wollen wir einige Ergebnisse ausziehen:

1. Die Zerstreuung der Pestbazillen haltigen Tröpfchen beim Husten der Kranken (von Dr. H. Toyoda und Dr. T. Yasuda, unter Anregung und Leitung von Prof. Dr. Shibayama beobachtet).

Obwohl es fast zweifellos ist, dass die Tröpfchenzerstreuung des Auswurfs der Kranken bei der Ansteckung der Lungenpest die Hauptrolle spielen kann, stellten die Autoren doch darüber eine Untersuchung an, um dies tatsächlich nachzuweisen, inden sie 28 Platten vor dem Gesichte des Kranken in verschiedener Entfernung aufstellten und den Kranken 2–3 Mal absichtlich stark husten liessen. Es ergab sich, dass sich beim ersten Male auf 3 Platten und beim zweiten Male auf 4 Platten die Pestbacillencolonien beobachten liessen. Die grösste Entfernung der Platten von dem Kranken war 110 cm. Aehnlich wurden auch die Versuche mit Meerschweinchen angestellt. Sie blieben aber immer gesund.

2. Der Widerstand der Pestbacillen im Sputum gegen äussere Einflüsse (von Dr. H. Toyoda und Dr. T. Yasuda, unter Anregung und Leitung von Prof. Dr. Shibayama).

Wenn der Auswurf der Kranken an einem Stückchen Sojabohnenkuchen angeklebt und dem direkten Sonnenlicht ausgesetzt wurde, so gingen die Bacillen schon nach 6 Stunden zu Grunde; bei diffusem Sonnenlicht aber wurden sie erst nach 20 Stunden getötet. Die Bacillen, welche einem Stückchen groben Hanfsackes anhafteten, waren nach direktem Sonnenlicht nach 14 Stunden abgestorben, während sie bei diffusem Sonnenlicht selbst nach 20 Stunden keine merklichen Veränderungen zeigten.

(Anmerkung: Auf 14 bzw. 20 Stunden kommen noch eine Anzahl Schwachlicht- und Nachtstunden, und zwar auf 14 Stunden Belichtung 16, auf 20 Stunden Belichtung 34 Schwachlicht- und Nachtstunden.)

Die auf ein Deckglas gestrichenen Bacillen starben bei direktem Sonnenlicht nach 1 Stunde, bei dunklem Wetter nach 6 Stunden.

3. Die Virulenz des Lungenpestbacillus (Dr. H. Toyoda).

Es ist schon bekannt, dass die Virulenz des Pathogenen-Bacillus für eine bestimmte Tierart durch wiederholte Passage von Tieren gleicher Art zunimmt. Es ist also wunderbar, dass die Lungenpest direkt von Menschen zu Menschen mit einer derart grossen Geschwindigkeit ansteckt. Es würde demnach sehr interessant sein

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festzustellen, wie die Virulenz der Lungenpestbacillen sich verändert, wenn sie wiederholt den Menschenkörper passiert hat. Nach den Versuchen ergiebt sich, dass die den Menschenkörper mehrfach durchgegangenen Keime bei verschiedenen Versuchstieren stark virulent wirkten.

Die Ratten und Meerschweinchen erlagen schon einer subkutanen Injektion von 1/1,000,000 Oesen. Die Mäuse starben auf subkutane Injektion von 1/1,000,000,000 Oesen nach einer Woche. Die Tarabaganen gingen nach subkutaner Injektion von 1/1,000,000 Oesen in 7 Tagen zu Grunde.

Hunde waren nach der Injektion von 1–2 Oesen in die Bauchhöhle und Lunge u. s. w. innerhalb 10 Tagen ganz heruntergekommen und verendeten unter Abmagern.

Es sei hier ferner auf die bei der Epidemie ausgeführten pathologischen und klinischen Beobachtungen von anderen Autoren hingewiesen, da diese später ihre Beobachtungen zu veröffentlichen gedenken. Schliesslich will ich nicht versäumen, dem Herrn Professor Kitasato, der seit Zeit von der japanischen Regierung nach der Mandschurei gesandt wurde, für das warme Interesse, das er unserer Arbeit betreffs der Bekämpfung der Seuche entgegenzubringen so freundlich war, meinen verbindlichsten Dank auszusprechen.

ORGANIZATION OF THE BACTERIOLOGIC SERVICES FOR PLAGUE IN THE SECTION FOR THE INVESTIGATION OF INFECTIOUS DISEASES.

Dr. MARIO G. LEBREDO, chief of the section, Health Department, Cuba.

The Cuban Department of Health owes its efficiency to the number of special sections that constitute it and to the harmony and discipline maintained among them.

Through their action yellow fever was eradicated from the country. But in the long struggle against this disease its extinction was not the only object attained. We were obliged to push to the utmost all the sanitary resources wisely and opportunely placed at our disposal, and we gained a vast fund of experience and skill for the defense against any epidemic manifestation.

It is of the greatest importance, at the beginning of an epidemic, that the health department should have a personnel prepared for the search after cases and suspects, a body of physicians for the official determination of the diagnosis upon which the sanitary action shall be based, a laboratory corps for bacteriologic investigations, an isolation hospital, and an effective service of sanitation.

Such is the organization of the Cuban Health Department. Medical inspectors, who maintain a close watch upon the suspected district;

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a technical official inspector, who visits all the declared suspects; a board of infectious diseases for the official determination. This board may make a diagnosis at once on clinical grounds, or may wait for a bacteriologic report. The bacteriologic study is made by the laboratory and section for investigations. The isolation is at Las Animas Hospital. We have finally the disinfection department of Habana, with its chief and a well-trained personnel.

To complete the organization, we should mention the health officers throughout the Republic; our quarantine officers, on guard against the importation of transmissible diseases, and, finally, moving, coordinating, and directing the several sections, a director of health, and, above him, a secretary in the cabinet, who brings to the Chief Magistrate of the Republic the public decrees and measures deemed necessary for the maintenance of the public health. If we consider all these several parts together, we will form an idea of the complicated but harmonious and coordinate organization of the sanitary department.

PLAGUE IN CUBA.

For several years past plague has shown itself in countries more or less connected with ours commercially.

In the year 1910, Dr. J. T. Cartaya, vice director of Las Animas Hospital, was commissioned to investigate the situation as to cholera and plague in Barcelona and the Canary Islands, and to acquaint himself with the laboratory technic followed in Hamburg for the investigation of both diseases.

In June, 1912, we heard suddenly of the official declaration of plague in the island of Porto Rico. The director of health recommended to the secretary of public health and charities that a commissioner be sent to Porto Rico to study the plan of campaign there established, the management of cases of the disease, and the manipulation of rats, maintaining at the same time a careful watch upon the progress of the epidemic and the dangers that might threaten us. I was selected for this commission, but subsequent events, with the manifestation of plague in Cuba, rendered the undertaking unnecessary. Quarantine restrictions were established against Porto Rico, together with other measures of defense. Popular instructions were issued, in which special attention was called to the rôle of the rat and the flea in the propagation of the disease.

About the same time our sanitary authorities were informed of an unusual mortality among rats in certain warehouses on Oficios Street, Habana. Action was immediately taken in an extensive zone, as if the diagnosis had been confirmed, causing much dissatisfaction among those who could not judge of the gravity of the situation. Thanks to this immediate and energetic action, together with other

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circumstances of locality, establishment of the new sewer system, and the season of the year, we were able to prevent an extensive epidemic.

Certain it is that the disease became well localized, and the rats that were left from the recent epizootic were rapidly destroyed by the measures instituted. This action was not so rapid but that some human victims were claimed.

The cases bacteriologically confirmed were three. It is possible that there may have been two previous cases, not recognized, and coinciding with the termination of the epizootic at the time we may designate as the moment of surprise of the infection.

A service of deratization was immediately established, and orders were given for the examination of rats at the laboratory of Las Animas Hospital. The service of inspection of the sick and of suspects in the hospitals was established at the same time.

On July 2 the secretary and the director of health, having decided to establish on a more permanent basis a special service for plague, with reference particularly to the bacteriological diagnosis, placed such services under my care, and they were organized in the manner now to be described.

ORGANIZATION OF THE SERVICE OF BACTERIOLOGIC DIAGNOSIS OF PLAGUE.

The danger of plague propagation in cities proceeds either from human or rat infection. Other rodents, equally susceptible, exist in numbers too small to constitute a danger in cities. We must therefore consider human plague and rat plague.

(*a*) *Human plague.*—Plague in man, if we except the pneumonic form, may be deemed inoffensive disease, if it be properly managed during the period which we may term "open" plague. We know that the germ is found in the inflammatory products of the lymphatic glands, or in the carbuncles of the cutaneous form of the disease, and so long as these lesions are closed, there can be little danger of communication by direct contact. The danger begins when the bubo, or the carbuncle, is opened; but, under such circumstances, there is no more danger, nor are the prophylactic measures to be taken different from those employed in handling cases of staphylococcus, streptococcus, or glanders infections with open lesions. When the infection becomes general, when there is bacteriemia, the danger is enhanced by the possibility of indirect transmission through the bites of insects. If, however, the patients are placed in conditions to prevent the access of such vermin, this danger of indirect propagation will also be avoided. Pneumonia plague, on the other hand, is extremely dangerous, because of the enormous number of bacilli contained in the sputum.

We may conclude, from the above, that the first and most important epidemiologic problem is one of diagnosis; accurate diagnosis, as

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soon as possible, of the case of plague, in order to place the patient in conditions of noninfectivity through isolation. This positive diagnosis can only be made with the aid of the laboratory, proving or disproving the suspicions that have been suggested by the clinical examination. We insist, therefore, that the bacteriologic diagnosis in human plague should be reached as soon as possible.

(*b*) *Epizootic rats.*—If the case of human plague can be easily made innocuous by proper isolation, how different is the situation when we have to deal with the epizootic of rats and other rodents.

The dangers of rat plague have created the necessity of establishing the service of deratization. This has two objects: On the one hand, the general destruction of rats, whether healthy (infectable element) or contaminated (dangerous element); and, on the other hand, the systematic collection of rats for the bacteriologic examination. It is of the greatest importance to make this search for infected rats in order to determine the focus against which we must direct our sanitary measures. Every rodent brought to the laboratory should be examined.

Based on these general considerations, the practical work was distributed as follows: (*a*) Collection of human material; (*b*) examination of rats and collection of rat material; the material collected passes on to (*c*) bacteriologic examination, and finally, when it is deemed opportune, or necessary, for the diagnosis, or to exhaust all the requirements of proof; (*d*) the experimental inoculation of the guinea-pig.

Each one of these procedures will be separately considered, but, before taking them up, it will be well to set down the following rules for the manipulation of all plague material:

(1) The examination of every case, and of all material held to be suspicious of plague, should be conducted with the same precautions as if the suspicions had been confirmed.

(2) The personnel selected for the manipulation of rats, and of the material collected from the sick, should be competent and well trained in technique, since slight carelessness may prove fatal to the worker or give rise to a new focus of propagation.

(3) The personnel engaged in each subdivision of the work should be as few as possible, and each should attend only the work assigned to him.

(A) COLLECTION OF HUMAN MATERIAL.

At the same time with the direction of all bacteriologic research, I assumed the duties of collecting the material, and for the purpose was attached by the secretary and the director to the board of infectious diseases. This enabled me to observe all the suspicious cases.

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The board is composed of distinguished practitioners, including the director of health. The duty of this board is to visit all suspects reported by the inspectors or by private physicians. The case is studied by them, and the diagnosis is pronounced. This diagnosis is official, and is the basis for all sanitary action, including the public declaration for international purposes.

Instruments required for the collection.—The collector should carry a small valise containing the following necessaries:

A bottle with bichloride of mercury solution, 1 x 1000.
A bottle of ether.
A small bottle with collodion.
Six to eight tubes with broth, with their labels.
Six to eight agar tubes, with their labels.
Three, at least, Luer syringes of 2 cubic centimeters capacity.
Several short needles, fine and stouter, for the same syringes.
Two syringes, at least, of 5 cubic centimeters capacity, with short and long, stout and fine needles, long enough, for instance, to take blood from the heart, when a cadaver is being examined.
One or two platinum loops for cultures.
A small alcohol lamp.
Three or four test tubes with heavy walls, sterile, and closed with cotton stopper.
A small box with one dozen slides, very clean.
A large test tube with Wright tubes and steel pens.
Several small sputum bottles with tight closure.
Absorbent cotton.
Forceps and scalpel in a sterile tube.
NOTE.—I would recommend that each syringe with its needles be carried in closed sterilized tubes. After using them, they should be returned to the tube, and may be placed again in the valise, on returning to the laboratory.

Pest lesions from which material may be obtained.—The material may be obtained from several places, according to the clinical forms, i. e., bubonic form (buboes), cutaneous form (carbuncles), pneumonic form (sputum), septicemic form (blood).

The plague bacillus is found in the blood of bubonic or cutaneous cases in the later stages of the disease.

Le Dantec gives us the following list, from Calvert's experience in Manila, of 32 cases, classified according to the number of hours before death in which the bacillus was found:

	Hours before death.
1 case	120
2 cases	96
5 cases	72
7 cases	42
17 cases	24

The three confirmed cases in Habana were, two of the bubonic form and one of the cutaneous.

The plague bacillus is usually found abundantly in all recent plague lesions. It is, therefore, important that the material should be

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obtained as early as possible in the course of the disease. This brings us to insist upon the importance of sanitary inspection of suspects and their isolation in hospital, in order to observe the case from the beginning, and to secure the first opportunity to obtain material for examination. A plague bubo will, at first, contain the plague organism uncontaminated with other organisms. Later, as the processes of suppuration or ulceration set in, the symbiosis with other organisms, or the liquefaction of the plague bacilli, may render their demonstration difficult or impossible. We feel sure that a diagnosis of plague may always be made by a simple examination of smears, if these be prepared with material obtained at a sufficiently early date from bubo or carbuncle.

The study of material from the lungs presents greater difficulties, as the sputum may contain a rich and varied flora. In septicæmic cases the finding of the bacillus in the blood may be quite easy, as Calvert has shown that 24 hours before death the organism may be found in enormous numbers in the blood. We should remember, however, that the gravest symptoms of an intense intoxication may exist with few or no bacteria in the blood. We took blood (4 cubic centimeters) from the arm of one of our cases, Mendez Guerra, in the gravest period of the disease, and found no organisms.

It is to be recommended, however, that cultures be made on agar or broth, with large quantities of blood (4 to 5 cubic centimeters), when we suspect the presence of one of the rare cases of primary septicæmia, without localization.

From the material obtained in each case we prepare cultures on plain broth, cultures on agar, and smears on slides.

The Wright's tubes we utilize only to obtain blood when we wish to arrive at a diagnosis by exclusion. Agglutination, for instance, may be necessary for the exclusion of typhoid or paratyphoid.

Technique of the collection of material.—Carbuncle: The technique is very simple, being similar to that employed to obtain material from any abscess or pustule. We should insist upon the utmost care in planting the cultures. The slightest vibration of the needle charged with plague material may cause serious trouble. Care should be taken also not to allow any insects—as flies, ants—to have access to the smears. These should be fixed immediately by heat.

After collection of the material the strictest antiseptic treatment should be applied to the carbuncle.

Buboes: I shall not refer to the open bubo, since the treatment in this case should be the same as in the carbuncle. We frequently meet with suspicious cases in which we find only a slight enlargement of the glands, without evidences of softening. In some the process of liquefaction may be just commenceing, and in others it may be well advanced, with fluctuation and considerable enlargement.

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The most convenient instrument for the extraction of the liquid is the Luer syringe. The glass of the barrel enables us to watch the entrance of the liquid, even when the quantity is small.

If the gland be still hard, with little or no liquefaction, the procedure should be as follows:

1. Everything should be ready to proceed immediately to the preparation of smears and cultures.

2. As in all cases of bacteriologic manipulation of this kind, the skin over the gland should be carefully sterilized.

3. A glass slide, held by means of forceps, is well heated over the flame for purposes of sterilization. It is then placed on the table, near at hand, where all the instruments are displayed, and it is allowed to cool. This is very important.

4. With the finest needle, passed through the flame and attached to the 2 cubic centimeters Luer syringe, we penetrate the gland, endeavoring to find the softest place on its surface. The puncture should be made in two movements; first, to perforate the skin, and then to penetrate the body of the gland at the most convenient point. The penetration of the gland gives a peculiar sensation of resistance at first, and sudden yielding as we pass the capsule. We can not expect to see any quantity of fluid ascend into the syringe unless there be marked softening in the tumor. Otherwise we may observe only a drop or two broken up into bubbles. This is sufficient for our purposes.

5. The needle is now withdrawn and the exudate is expelled upon the slide. If it forms drops, the cultures will be made from these with the platinum loop. The remainder will be spread out upon the same and other slides. It is advisable to prepare at least two films, one for the direct staining and the other for the Gram stain.

Even when it appears that no liquid has been obtained the attempt to prepare cultures should be made. If we find, for instance, that no liquid is expelled upon the slide, we should draw some sterile broth through the same needle into the syringe. Cultures should be made from this liquid, and even smears may be attempted.

If we have reason to believe that the liquid is too thick to run through the fine needle we may try a larger one, though this is to be avoided, because the puncture may remain open and flowing. We find no advantage in local anæsthesia, and advise against it. We have made two or three punctures in the same gland in the endeavor to find fluid. This has been perfectly well tolerated by the patient, and no accidents have followed. The procedure described was always successful in obtaining cultures and smears.

6. The syringe and needle are replaced, without washing, in the test tube.

7. The seat of the puncture is covered with collodion.

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We assert that there is no danger in handling a case of human bubonic plague if the precautions above described are followed.

SPUTUM: It is more convenient to collect the sputum directly from the mouth into a small wide-mouthed bottle.

BLOOD: For the collection of blood, the usual puncture of the vein at the bend of the elbow is advised. The blood is obtained by aspiration in a 5 c. c. Luer syringe. Cultures should be prepared at once. This procedure is not generally necessary. By the time that the bacteria invade the blood, the local manifestations are sufficiently advanced to yield the required material. The method might be useful in cases of late appearance of cutaneous lesions. Such cases are rare.

Collection of material from the cadaver.—Without making a complete autopsy, material may be obtained from the buboes or skin lesions that may be found on the suspected cadaver. It may be necessary to puncture the heart with a long needle.

Smears and cultures should be made. The rich cadaveric flora may render difficult the demonstration of the original pathogenic infection. We shall consider later on the special methods that must be applied under these circumstances.

(B) COLLECTION AND EXAMINATION OF MATERIAL FROM RATS.

Place of origin of the rats to be examined.—The deratization service, organized in the first days of the campaign, was in charge of the capture and destruction of the rats in the suspected district and its vicinity. A premium of 5 cents per rat was also offered.

The rats that were found dead and the rats caught alive and immediately killed were all thoroughly wetted with petroleum and placed in heavy paper bags, which were also wetted with petroleum. Each bag had a card attached, upon which was written the number of rats contained, place where found, whether found dead or alive, and the name of the inspector who made the collection. Rats from different localities were always sent in separate bags. The forwarding of rats found dead did not imply any suspicion of plague, since many were killed by poison.

Place selected for the examination of rats.—The examination was commenced at the laboratory of Las Animas Hospital, Mr. John R. Taylor and his assistant, Mr. Lopez, being in charge of the service. Two hundred and ninety-one rats were examined from the 24th of June to the 8th of July. At that time the examination was limited to the suspected zone only, and was restricted to rats that were found dead. The number of rats destroyed was much greater.

It is interesting to note these facts in connection with the results obtained both at that time and subsequently; namely, that not a single rat has been found infected with plague. We may reasonably

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assert to-day that all infected rats must have been killed during the energetic fumigations of the first days of the campaign.

The place for examination of rats was subsequently transferred to the laboratory of investigations. It is important that an appropriate place be provided exclusively for the examination of plague-infected animals, whether they be rats naturally infected or guinea pigs inoculated for experimental purposes. The unexpected outbreak of an epidemic, however, might find us unprepared, and any portion of the laboratory may be used for this work without danger if we take the following precautions: First, That the rats be brought to the laboratory without live fleas on them. Second, Manipulation of the rats with special care that no flies alight on the body during the autopsy. Third, Immersion of the body, after the autopsy, in a strong disinfectant solution until the body is carried to the crematory.

The building which we have constructed especially for this service meets all the requirements. It consists of two compartments with one communicating door. The floor is made of impermeable concrete, and the walls are lined with cement to the height of 88 centimeters in room A, and of 1 meter and 85 centimeters in room B. Both rooms, therefore, constitute a box of cement. Windows protected against insects. The entrance door provided with a wired cage.

It does not seem necessary to point out the advantages of such a structure. It can be easily disinfected, and the floor may be kept moist with a solution of chloro-naphtholeum, an excellent insecticide.

Personnel.—For this work, Mr. Taylor and Mr. Lopez were detached from Las Animas Hospital and placed under my orders at the research laboratory. Both of them have considerable experience in the study of rats and fleas, having been long ago prepared for this service by Dr. Guiteras. I exercised at the same time the necessary supervision over the autopsy work.

I do not think that it is necessary to have seen the rat lesions of plague in order to diagnose them properly. I do think it is absolutely necessary to have a large experience in the necropsy of rats and laboratory animals and to be acquainted with normal appearances in order to recognize all that is abnormal.

All such lesions should receive the most careful attention.

Transportation of rats.—In order to systematize the service, it was decided that the delivery of rats should be made three times a day; between 8 and 9 o'clock in the morning, between 1 and 2, and at 5 o'clock, in the afternoon.

The rats received in the morning and noon hours were examined at once. The rats received in the afternoon were kept locked and sealed in a cool place until the following morning. Under these circumstances, it was quite rare to have to examine rats in a state of putrefaction.

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Containers—Cans.—The receptacles for the transportation of rats were large cans of galvanized iron with well-fitting covers. The rats were placed here in their paper bags soaked in petroleum. The laboratory was provided also with similar cans for the reception of nonsuspicious rats after the autopsy.

Manipulation of rats—Instruments—General directions.—The examination of rats was made upon an easily sterilizable glass table. On the floor, under and around the table, were spread blankets which were kept always moist with a solution of chloro-naphtoleum. A board, measuring 50 by 30 centimeters, is placed upon the table. The animal is nailed to this board whenever it is deemed necessary for the necropsy. The board is kept constantly wet with a disinfecting solution. Upon the same table is kept a glass vessel containing bichloride solution, and cotton which is used for wiping the instruments; another vessel with the same solution is used for the hands.

The operator sits at the head of the table upon a high stool, and has at his left hand one of the cans above described. The assistant stands to the left of the operator, having at hand the can containing the rats in the paper bags. Another employee takes whatever notes may be dictated. As each bag is withdrawn from the can, he records the number of rats in the bag, species to which the rats belong, whether the animal was caught dead or alive, the sex, place where captured, and the name of the collector.

When a rat is found with lesions, it is marked with a letter corresponding with one on the notebook, for identification when we come to make a special examination. A description of the macroscopic appearances is then dictated. The note taker hands to the operator slides and Petri dishes for the preservation of the material that may be necessary for later investigation. The dishes and slides are also marked with the same letter and the date.

Necropsy.—It may be performed in two ways—one, the more rapid, in which a general inspection is made at once. The assistant holds the animal with forceps by the anterior extremities, and the operator opens it from the pubis to the chin, with scissors. In the other and slower method, the animal is nailed to the board through the chin and front and hind legs. The latter method has been followed with all rats from the suspected district. In all cases the characteristic lesions of plague are systematically looked for, namely:

1. Dissection of the skin for subcutaneous congestion or hemorrhagic suffusion.

2. Examination of the inguinal, axillary, and cervical glands: Normally, the axillary and inguinal glands are very small, and are readily lost in the subcutaneous fat of well-fed rats. A bubo in these regions is, therefore, quite striking. The bubo is, besides, accom-

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panied by more or less marked œdematous infiltration and periglandular hemorrhages. In the neck it is more difficult to recognize the enlargement, especially if the rat has been recently infected. Following the experts of India, we should then compare one side with the other. There may be enlargement of the glands without plague infection. In such cases the appearance of the surface of section of the gland is of value in the diagnosis.

The plague bubo should present, macroscopically, areas of compact, necrotic tissue, of caseous appearance, and should be rich in bacilli. At times an enormous degree of enlargement is reached, with a large necrotic center and an indurated capsule. The purulent bubo is very exceptional, and negative of plague. There may be some softening in the necrotic area.

3. Abdominal cavity: The most important viscus in the plague rat is the liver. The lesions here are characteristic in varying degree. The surface appears more or less extensively punctuated. The spots are white, gray, or yellowish, and quite distinct upon the red surface of the organ. At times the dots or spots are less distinct, and the organ is described as mottled. The size of the spots varies, but is never larger than a pin's head. This lesion can be easily demonstrated in experimentally infected rats.

The spleen is somewhat enlarged and dense.

There are no effusions in the peritoneal cavity.

4. Thorax: Pleural effusions and congestion of the lungs are quite frequent.

When the macroscopic examination is absolutely negative in its results, the rat is thrown into the empty can near the operator. When suspicious lesions are found, material is removed for subsequent investigation, and the carcass is thrown into bichloride solution, where it is kept until ready for cremation.

Collection of material.—The immediate results of the necropsy may be insufficient for the final decision. One or two lesions, perhaps imperfectly developed, may be present, and the diagnosis remains in doubt. In such a case we make a direct microscopic examination of the material. This double system was followed in India at first, but when the amount of material became enormous the immediate results of the necropsy were deemed to be generally sufficient.

In the study of our small outbreak we judged that it was best to complete the investigation with a direct bacteriologic examination of the material and a study of the cultures derived therefrom.

In suspicious rats the following technique was systematically carried out, i. e., smears of blood from the heart, fragments from the spleen, fragments from the enlarged glands, and fragments from any lesion observed.

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The smears were fixed immediately and marked with the letter corresponding to the rat; and the pieces of the organs were passed to the bacteriologists in Petri dishes, similarly marked, for direct study and the preparation of cultures.

This procedure enabled us to go on with the necropsy of rats without any loss of time.

Usual pathology of the rat in Cuba.—The number of rats thus far examined exceeds 10,000, and I am convinced that there is, at the present time, no special, acute epizootic affecting these rodents.

In India, and other places, it has not been rare to meet with forms of epizootic infection, which made it necessary to carry on minute investigations for the identification of lesions and germs, before a negative diagnosis of plague could be decided.

The only disease we have found with relative frequency is a lung infection producing a lobular lesion, generally confined to one lung. It develops in the shape of nodules, large and small, of a grayish-yellow color, and somewhat raised above the surface. At times they are confluent, forming one large necrotic mass, which, in one case, completely replaced the left lung, pushing the heart toward the apex of the right pleural cavity. The necrotic material may be described as caseo-purulent.

The bacteriologic investigation of these lesions has shown in some cases a staphylococcus, in others, a streptococcus, and in still others, nothing. No acid-fast organism has been found, and the inoculation of guinea pigs gave no results. We should state that no lesions were found in other viscera, nor was there any subcutaneous congestion or enlargement of the lymphatic glands. There was no evident emaciation. It appeared to be a chronic process localized in the lungs.

The absence of acute diseases in the rats of Havana has facilitated their examination, enabling us to give their due value to normal appearances and to the lesions occasionally found—lipoma, cirrhosis, traumatic suppurations, hepatic parasites.

Manifestations produced in rats by the procedures employed in killing them.—Death produced by poisons or by burns (ignited alcohol or hot water) gives rise to lesions that require always a special study of each individual case. Burns will always give subcutaneous, and even visceral, congestions. Exudations in the pleural cavities may likewise be produced. Such lesions can not lead to any confusion with plague, but they required study and investigation which might have been avoided if other methods of killing had been employed.

Spots of varying size may appear in the liver in these cases of burns, but they can not be confounded with the special, disseminated, necrotic process of plague. The poisoning with chalk produces an enormous bloating of the animal, as if it had been insufflated.

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There is in such cases an enormous accumulation of gas in the peritoneal cavity.

Number of rats.—Up to the present date we have examined 10,052 rats without finding one with the macroscopic characteristics of plague.

Rat cards.—A daily report of the rats examined each day is forwarded to the Director of Health, with the data already referred to above.

A special card is prepared for rats that present any lesions, following the model I devised, which is herewith appended. The immediate results of the necropsy are there noted, and the card is set aside, to receive later on the additional results of the bacteriologic investigation.

(c) BACTERIOLOGIC EXAMINATION OF THE MATERIAL.

The bacteriologists in charge of this work were Dr. Alberto Recio and Dr. Manuel Martinez Dominguez.

The material handed to them may be human or rat material. Let us examine the procedure in each case:

(*a*) *Human material.*—Bubo and carbuncles: This material, collected at the bedside, is brought to the bacteriologists in the shape of films upon slides, and cultures in broth and in agar. The films are examined at once. One film is examined with carbol-methylene-blue, or carbol thyonin. Another film is stained after Gram. In the first, we look for the morphologic characteristics. If, in such preparation, we find a short bacillus, about 2 by 1 micra, with rounded ends, and presenting a bipolar stain, there is strong reason to suspect plague.

It is certainly true that, in man, in necrotic or purulent lesions, of whatever nature they may be, we never find an organism resembling the plague bacillus. We may meet with varieties of coccus, diplo, staphylo, or streptococcus, gonococcus, or glanders bacillus; but there is no organism resembling plague that may be found in abscesses or in ordinary forms of adenitis. The bacillus of Ducrey, which might more closely resemble the *B. pestis*, should not be confounded with it.

The weight of evidence becomes greater if the material is collected from closed lesions early in the process, before the liquefaction necrosis or suppuration is far advanced. Under such conditions the plague bacillus should be numerous, and found in pure cultures.

The presumptive diagnosis of the first two cases that occurred in Cuba was made on these grounds, though we waited 48 hours to confirm the diagnosis by the study of the cultures before making the official declaration of our first case, that of Mendez Guerra. The examination of the films had revealed the presence of large numbers of the plague organism.

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Secretaria de Sanidad y Beneficencia.

Direccion de Sanidad—Seccion de Investigaciones, etc.

LABORATORIO EXPERIMENTAL "DUQUE."

Servicio de peste.

Día del examen.....
Rata..... Especie..... Sexo.....
Lugar donde fué cogida.....
Viva ó muerta.....
Remitente.....
Diagnóstico.....

Examen macroscópico (autopsia).

Putrefacción.	Emaciación.	Rigidez.
Congestión subcutánea.....	.....	
Su fusión hemorrágica subcutánea.	General.....	
	Periganglionar.....	
Ganglios inguinales.....	Derechos.....	
	Izquierdos.....	
Ganglios axilares.....	Derechos.....	
	Izquierdos.....	
Ganglios cervicales.....	.....	
Exudado pleural.....	.....	
Exudado peritoneal.....	.....	
Hígado.....	.....	
Bazo.....	.....	
Hemorragias.....	.....	

Examen microscópico.

Ganglio.....
Bubón.....
Bazo.....
Sangre del corazón.....
Otras lesiones.....

Experimentación animal.

Cultivos.

Observaciones.

.....

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Another preparation is stained by Gram, and if it loses the coloration we have further evidence that we are dealing with *B. pestis*. I believe we may assert that if a man presents clinical symptoms of bubonic plague, with involvement of glands, we may in a very short time—the time that is necessary for the examination of the preparations—either assume the gravest suspicions of plague or give a negative diagnosis.

It is very advisable that in localities where plague has not previously existed one should at once proceed to confirm these strong suspicions by applying to the germ that has been isolated all the tests that are recommended for its identification. For these reasons, in spite of the strong presumption in favor of a positive diagnosis, we made in our cases a careful study of the cultural characteristics of the organism.

Cultures.—These were made at the ordinary temperature of the room, which averaged 26° C., a favorable temperature for the growth of the plague bacillus. The specific cultural characteristics may be appreciated at the end of 24 to 48 hours.

Let us take them up in order:

(1) Examination in the hanging drop shows that the germ is nonmotile.

(2) Cultures in broth show, at the end of 24 hours, a pulverulent deposit in the bottom of the tube, the rest of the liquid remaining clear. At the end of 48 hours the deposit is more decided, and subsequently there may be some clouding of the liquid, but always with a tendency to sedimentation.

If the broth culture be left carefully at rest, the organism may grow downward from the surface of the liquid, forming pendent flocculi. These, finally, also drop to the bottom. Haffkine succeeded in accentuating this phenomenon, producing what he described as stalactites by placing a very small quantity of oil upon the surface of the liquid. Too large a quantity of oil would prevent the growth. The stalactites are at times quite fine, and at others much thicker. They may grow downward until they reach the bottom of the tube, as we were able to observe in one of our cultures. These results are not commonly obtained, but require considerable care in the manipulations.

A film prepared from a broth culture, stained with methyl blue, will show characteristic chains of the bacilli, still maintaining their bipolar coloration. The rounded ends of the individuals composing the chain give to the whole the appearance of a rosary made up of a series of almonds.

(3) The cultures on agar, in the first pass from the animal to the culture medium, is rather slow, so that at the end of 24 hours the colonies are but slightly developed, and the characteristic features

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are scarcely noticeable. At the end of 48 hours we can readily demonstrate, by means of a magnifying glass, the presence of numerous small, rounded, transparent colonies. These gradually become confluent, forming a delicate yellowish film. This presents a gummy consistence and is somewhat adherent. The microscopic preparations from such cultures are very typical. The subcultures obtained from the first original cultures are more rapid in their growth.

If the cultures in broth and agar show a growth corresponding with the above characteristics, we may feel sure that we are dealing with pure cultures of the *Bacillus pestis*. As we have already mentioned, this is always the case if the material has been taken during life and sufficiently early. If mixed cultures are obtained, we should proceed to the separation of the several bacteria by laboratory methods. The pure cultures must be subjected to other tests for identification.

(4) Cultures on potatoes: The plague bacillus does not grow on this medium; at least, it does so with difficulty and very slowly. This feature may be utilized for purposes of differentiation with the glanders bacillus.

(5) Three per cent salt agar: On this medium the growth is slower and scantier, but quite characteristic. The organism takes here the most bizarre forms. We can scarcely imagine that we are dealing with the same organism.

(6) Milk: The plague bacillus causes no coagulation or precipitation of casein.

(7) Gelatin: Slant tubes at 19° C. show scarcely any growth during the first 24 hours. At the end of 48 hours we observe minute colonies slightly raised above the surface, transparent, with irregular edges. On the fourth day the colonies become confluent, forming a delicate granular film, which become yellowish. The most important feature of these cultures is that the gelatin is not liquefied.

(8) The indol reaction: This reaction can not be demonstrated by ordinary methods in broth cultures of *B. pestis*. Dr. Martinez Dominguez, however, finds that a slight indol reaction may be obtained between the third and sixth days if the cultures are grown in broth clarified by animal charcoal and if the reagents are carefully applied by the ring method.

Dr. Recio and Mr. Taylor, of Las Animas Hospital, have obtained the same results.

The methods we have described are those that are generally recommended for the identification of the plague bacillus.

It will be of interest to tell of other cultural characteristics that have been described by Dr. Martinez Dominguez.

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The Grimber and Legros medium: There is no alteration in the first 24 hours. On the third day the red coloration appears, without the production of gas.

Klopstock's medium: No change in the first 24 hours. On the third day the change from blue to red is more intense than in the Grimber medium. There is no production of gas and no coagulation. No further change is subsequently produced.

Drigalsky-Conradi medium: At the end of 24 hours, in stroke cultures, we observe a slightly homogeneous, bluish film. At the end of 48 hours the strokes redden somewhat and the color becomes more intense later on. The colonies are very adherent.

In broth, with the several sugars, no gas is produced.

Sputum: This investigation may be rendered quite difficult by the presence of numerous other organisms. In such cases we may have to appeal to animal inoculations for the isolation of the germ.

Blood: The blood cultures will be either positive or sterile.

(*b*) *Rat material.*—We hand over to the bacteriologist films prepared with blood from the heart and fragments of the spleen, liver, lymphatic glands, and any other organ that may present suspicious lesions. These are contained in Petri dishes.

The bacteriologist prepares films from all these fragments. The films are stained, and search is made for small bacilli with rounded ends, presenting a bipolar stain and decolorized by Gram. In rats that usually arrive in the laboratory several hours after death the bacteriological investigation requires very special care, because several organisms found in rats more or less resemble the plague bacillus. The importance of this will be appreciated when we consider that the positive diagnosis of plague in a rat, even in the absence of human plague, will give rise to an active and costly sanitary campaign. On the other hand, an infected rat that has been overlooked may occasion serious loss of time in meeting a grave situation.

In our laboratory the examination of rats has been pushed to the extreme. A bacteriologic investigation has been made of every rat presenting lesions of any kind. And in those in which a bacillus has been found in any way suggestive of plague we have added the experimental inoculation of animals.

After the examination of the smears the bacteriologists prepare the required cultures. The cultures are always mixed. The bacteriologic investigation of rats in which decomposition has commenced is so tedious that it is best to at once try the test of inoculation of the guinea pig.

Though the experiment in the guinea pig constitutes an absolute demonstration of the presence of the plague bacillus, we should not forget that in India the test has failed in the case of 21 per cent of

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rats that had already undergone putrefactive change. The experiment fails only in 1 per cent of cases where fresh material is used.

We should not conclude, however, that the diagnosis of plague in the rat is necessarily a matter of extraordinary difficulty. Our endeavor should be to valorize properly the various results obtained. The macroscopic features of the autopsy constitute the most convenient test. It may be readily understood by the laity, as is shown in countries where large experience has developed a great many experts.

A diagnosis founded on the macroscopic observation is sufficient in the great majority of cases. Besides, the plague lesions generally contain enormous numbers of bacilli. The appreciation of these tests is made the easier if we insist, as we have done, upon the importance of bringing the rats to the laboratory as soon as possible after their capture.

The bacteriologic findings in the examination of the human material, as expressing either suspicions or certainty, are reported to the director of health at once. We need not insist upon the importance of a prompt declaration of the case.

Equally urgent should be the reporting of positive results obtained in the examination of rats. The findings, in this case, are noted on the special card which, as previously stated, is registered in connection with every suspicious rat.

We have examined 10,052 rats, and the number that required a bacteriologic examination has been very small. None were found to be infected with plague. We have given our explanation of this fact, which is proof of the activity displayed in the campaign of sanitation before the systematic examination of rats was commenced.

(D) EXPERIMENTAL INOCULATION OF THE GUINEA PIG.

When employed.—Animal experimentation is used to great advantage for the identification of the plague bacillus after its isolation. I do not deem this proof to be indispensable. Nevertheless, when the diagnosis of plague is made for the first time in a community, it is advisable to complete the record of the occurrence by adding the experimental proof to the clinical histories and the bacteriologic investigation.

Animal inoculations are of value when it becomes necessary to isolate the suspected organism from material containing complicated symbiotic growths. They are also of value in the examination of suspected rats already in a state of putrefaction.

We have applied the test in the study of suspicious rats, conducting at the same time the bacteriologic investigation. The result was always negative. Not so in the inoculations made with

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material from our three human cases. We call special attention to this fact. The guinea pigs inoculated with material from Mendez Guerra, Helguera, and Esteibar died with the characteristic lesions of plague.

Guinea pig as a reagent.—The guinea pig, because of its extreme susceptibility to plague infection, is an ideal animal for tests of this kind. The susceptibility is such that the inoculation is obtained by simple friction of the material upon the shaved skin surface. Other infective organisms that may be applied at the same time do not penetrate the skin. A truly selective method has been derived from the knowledge of these facts. We may speak of this procedure as one of indirect isolation of the plague bacillus.

Technique of the inoculation.—Some portion of the abdominal surface is shaved. I have selected a space about three or four centimeters square in the median line just above the position of the urinary bladder. It is recommended not to employ any soap in preparing the skin, but I can see no objection to its use if the surface be carefully washed and dried. Care should be taken not to injure the skin in the act of shaving. The animal is then set aside whilst we prepare the material for the inoculation, namely, the suspected organ or culture that we wish to test, platinum loops, cotton, and vessels with antiseptic solutions.

The shaving of the region is not necessary; it may be found sufficient to pull out a tuft of hair.

The animal is now held by an assistant, exposing completely the shaved portion. It is advisable to once more apply the razor, to produce some reddening of the skin. The tissues or the cultures that we wish to inoculate are now rubbed upon the surface. The piece of tissue is taken from the Petri dish by means of forceps. It is then returned to the dish and the whole is submerged in a vessel containing muriatic acid or some strong disinfectant. A blunt instrument is now used to rub in the material left upon the surface.

In the case of cultures on agar or broth we employ a large platinum loop to place the material upon the surface, and rub it in with a blunt instrument. The back of the blunt end of a pair of scissors may be used for this purpose. The instruments are thrown into the disinfecting solution, and the animal is placed in the glass jar that has been especially prepared for the occasion.

Special animal jar.—In order to keep the guinea pig confined during illness, and to observe it without any danger, the jar should be carefully protected against the entrance of insects; and the exit of fleas, lice, and acari should be guarded against.

The vessel for this purpose should be at least 30 centimeters high and sufficiently wide to allow the animal some freedom of motion.

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At first we were obliged to use narrow jars, but sufficiently high. The experiments at Las Animas Hospital have shown that the flea can never jump higher than 20 centimeters. The jar then should exceed this height from the back of the animal.

Before placing the pig in the jar, sufficient food should be introduced to last from five to nine days or longer. The vessel is covered with fine gauze, doubled fourfold. The jar is then labeled and set aside in a well-protected place, preferably in the same building used for the examination of rats. The jar should not be uncovered until the termination of the period of observation or the death of the pig. The jar may be then opened with the precautions to be described.

Observation of the inoculated guinea pig.—Even when inoculated with very virulent cultures the pig does not show, in the course of disease, any very striking symptoms. The animal may endure a varying number of days. Generally, in the first 24 hours it will appear rather dull and will begin to lose its appetite. This condition will become more accentuated on the second and third days, when the hair of the neck and of the lids will stand out. The eyes become sunken. The pig refuses to eat, or may make only occasional attempts. From the second day, we notice that the pig feels some discomfort about the inguinal region; the hind legs are kept somewhat separated in moving, and attempts are made to scratch the region. There is no asphyxia, no convulsions. The animal becomes motionless and dies slowly.

The duration of the illness is expressed in the following table from the Reports of the Indian Plague Commission (Journal of Hygiene, Vol. VIII, p. 349):

	Number guinea pigs.	Per cent.
Death in—		
2 days	3	2.4
3 days	24	19.5
4 days	23	18.5
5 days	26	21.1
6 days	18	14.6
7 days	10	8.1
8 days	2	1.6
9 days	2	1.6
10 days	2	1.6

Death usually occurs between the third and the sixth day. In our inoculations the duration was as follows:

Guinea pig inoculated by rubbing the skin with a 5 days' mixed culture on agar, from the exudate obtained from the inguinal gland in the case of Esteibar; death in 5 days.

Guinea pig inoculated by rubbing the skin with a 5 days' culture on agar, three removes from the material obtained from the bubo of Mendez Guerra; death in 6 days.

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Guinea pig similarly inoculated with a 3 days' pure culture on agar, three removes from the original material obtained from the bubo in the case of Helguera; death in 8 days.

The results obtained with cultures that did not seem to vary much in virulence show the differing susceptibility of the animals. It would be of interest, with a view to early diagnosis, to examine daily the seat of the inoculation, since this presents all the characteristics of a primary lesion. But I consider such procedure as highly dangerous. It is best to wait for the death of the pig and investigate the lesions that are found post-mortem. It may be more convenient, when death is approaching, to kill the animal, in order to avoid the decomposition that would set in if it died during the night. Death may be produced rapidly by pouring chloroform through the gauze cover.

The chloroform kills the animal, and the parasites that may be attached to the skin. A few minutes later a one-half per cent solution of tricresol is poured through the gauze to fill the jar to the top. This solution destroys any parasites that may be still living, and sterilizes the surface of the primary lesion at the seat of inoculation.

The solution of tricresol is allowed to act during one-half hour, and the guinea pig is then lifted by means of long forceps, after partially raising the cloth cover, which is subsequently replaced in position. It is thus allowed to stand 24 hours before emptying the liquid.

Necropsy.—The post-mortem is performed in the same building where the rats are manipulated, and in the same compartment in which the inoculated pigs are kept.

Two assistants only are required, one for the post-mortem and the other for making the cultures. The technique is very similar to that of rat necropsies.

Seat of inoculation—Experimental carbuncle.—By the fourth to sixth day, the characteristic features of this primary carbuncle have in part disappeared. We find, however, infiltration and thickening of the skin, limited to the region of the inoculation, and produced by a gelatinous substance. Later on, there is more induration, with perhaps a necrotic area in the center. The skin and subcutaneous tissue are equally infiltrated and adherent, forming one mass.

Subcutaneous tissue.—The general injection seen in the rat does not occur in the guinea pig.

Bubo.—The elevation is appreciable to the eye and touch. The buboes occupy the inguinal region, and are usually much larger on one side than on the other. The larger one is the primary bubo. The normal lymphatic glands of the gninea pig are extremely small.

The periglandular tissue is infiltrated and edematous, and presents also hemorrhagic suffusions. The glands are neither hard nor fluctu-

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ating. On section, the medullary portion, consists of necrotic, grayish-yellow caseous tissue, while the cortex is harder and somewhat fibrous. The typical plague bubo is never purulent. All the necrotic glands contain numerous bacilli, and they are found also in those that do not show any marked macroscopic changes.

The axillary and cervical glands appear normal, though the perivascular tissue of the former may show some hemorrhagic suffusion.

Abdominal cavity.—The characteristic lesion is found in the spleen, while in the rat we find it in the liver. The spleen presents a red color, usually not very dark. Upon this background we find the specific nodules of a white, grayish, or yellowish color, their number varying from a few to a dotting over of the whole surface. They are never confluent. They are small, delicate, well distributed, and are made of necrotic cells. Sometimes they appear somewhat blurred, as if seen through the capsule, but they are always sufficiently distinct and characteristic. The organ is somewhat enlarged.

The liver presents no characteristic lesion.

Thoracic cavity.—We found no prominent lesion in these organs.

Some experimenters describe the formation, in the lungs, of nodules similar to those of the spleen, but larger and irregular when the infection has run a more chronic course. Our guinea pig that died on the ninth day showed no such lesion. No exudate was found in the pleural cavity.

(E) VALUE OF THE METHODS OF DIAGNOSIS.

There is no one method superior to the others for a rapid diagnosis. They are all good, and each one has its own utility.

We may admit, however, that the clinical method is inferior. It happens here, as with the pyogenic infections, that the clinical diagnosis is one of suspicion, which requires a bacteriologic investigation.

Discarding, therefore, the clinical examination, which is the best of the two bacteriologic methods we have discussed, the direct microscopic examination and study of the cultural characteristics on the one hand, or the experimental proof on the other hand?

In human plague the best procedure is the bacteriologic examination of the suspected material.

If we have a good sanitary organization and the clinical examination of the suspects is made in good time the exit material can not fail to show, if the case be one of plague, the typical organism in the direct examination of smears and pure cultures on the several culture media.

Within half an hour the diagnosis may be made by direct examination, and confirmed in 24 or 48 hours by the identification of the

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cultures. If we then desire further proof it may be looked for in the experimental inoculation.

The inoculation method is much inferior for the diagnosis of human plague, because it requires from 5 to 7 days.

If we have thus been able to establish rules for the diagnosis of human plague it is not so with the diagnosis of murine plague.

If the rats be fresh the direct examination and the culture methods may be as useful as in human plague. But when the examination is made several hours after death it may be difficult or tedious to attempt the isolation of the organism without experimental inoculation of the guinea pig.

On the other hand, in putrefying rats the experimental inoculation may fail in 10 per cent of the cases, thus necessitating the carrying out of both methods at the same time.

It is for this reason that we have insisted upon the frequent collection of rats and their delivery three times a day at the laboratory. In India the macroscopic inspection of rats is given a great value, and it is held to be sufficient for the negative diagnosis. It could scarcely be otherwise when we consider the enormous mass of material they have to handle in those endemic foci. Whatever is done there must be assented to as a gain, a reduction of evil conditions. But in our position we were struggling for a rapid and complete extermination of the recently imported infection. Hence the employment here, in the diagnosis of rat plague, of all the methods we have described, as was done originally in India.

THE RELATION BETWEEN TRAFFIC AND THE SPREAD OF BUBONIC PLAGUE.

W. C. Rucker, M. S., M. D., Assistant Surgeon General, United States Public Health Service.

Sanitary science, in the ultimate analysis, resolves itself into a defense against the animal and vegetable forms of life which produce disease in man. It is a manifestation of the law of the survival of the fittest through the erection of bulwarks of one sort and another against those agencies which will exterminate man if man does not control them. All nature is at war, one with the other. Each species has its natural enemies. Man, in particular, has, since the beginning of time, been assailed by a myriad of hostile lower-life forms, and it is to the constant whetting of the wits in this struggle for supremacy that he owes the development of his superior intelligence. With the dawn of reason came traffic, and man, as the only animal which sells and barters, has been obliged to erect special barriers to prevent his vegetable and animal foes from attacking him through the avenue of

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commercial intercourse. Disease, which, after all, is but an outward and visible presentment of this never-ceasing battle, has always been recognized as the constant companion of commerce, and of no disease in particular is this more true than of plague. Who can doubt that at some remote age plague was confined to some small valley from which it has been carried to all parts of the globe by the roads of trade "which lead you o'er the world"? What galley, seeking Cornish tin, brought the first plague rat to England, just as the Ark of the Covenant carried the disease to the Philistines?

The relation of traffic to the spread of bubonic plague is a simple equation, the one being to the other directly as the opportunity which traffic affords for the spread of rats from plague foci. It may therefore be taken as axiomatic that if we would prevent traffic from spreading plague we must concentrate our efforts on the prevention of the migration of rodents in traffic. If we successfully control the peregrinations of the murinae, we will control the spread of plague, because for all practical purposes man may be disregarded as a great factor in the grand tactics of plague. It is true that human pneumonic plague has been held responsible for certain outbreaks, and it is also a fact that verminous persons suffering from the septicæmic form of the disease have acted as infection nidi; but these are local matters only, and bear no vital relation to the world spread of plague. Plague usually passes from rats to man, not from man to rats.

It were better that the sanitary authorities had constant and accurate information as to the existence of rodent plague in the various ports, but, unfortunately, such knowledge is not always obtainable, or perhaps only too late to prevent an exodus of the disease from a previously unrecognized focus of rodent plague. The measure then is obvious—let there be a world-wide embargo on rats. Let no rat take passage on any ship whatsoever, and if, at the port of destination, any rat is found on board, the penalty which he shall suffer be death. Every ship-borne rat must be regarded as a potential enemy, not only to the life but also to the prosperity of man. Emphasis may be laid on the ship-borne rat, because the overland spread of plague is not of material influence on the end result. Plague does not follow the caravan routes by reason of the transportation of rats; in fact, it is more than probable that verminous persons act as disseminating agents in such a situation; the carriage of infected rodents by freight trains undoubtedly does occasionally occur, but these are all matters of minor consideration in the universal spread of plague in which the chief agent is the ship-borne rat.

We have laid too much stress in the past on the human passenger and we have paid too little attention to the rodent passenger. It is futile to examine and detain persons who have been exposed to plague

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infection and to neglect rodents which actually have the disease. It is equally absurd to quarantine against passengers from infected ports and to permit the landing of rats from ports which are considered safe merely because plague has not been reported from them. There is only one policy which we can logically pursue, and that is to regard all ship-borne rats as elements of danger, to prevent their entering or leaving ships, and to confine our operations against passengers to the prevention of embarkation by persons who are actually suffering from the disease or who are in a verminous condition. It is time that there was a revision of the regulations of the International Sanitary Convention of Paris to meet the present-day interpretation of the method of the dissemination of bubonic plague. It is the plague rat which we must prevent from taking passage, and we should not confine our attention to the human passenger.

The first element in preventing rats from entering ships is a rat-proof water front. This is not only a matter of importance in relation to the spread of plague by traffic; it is also an insurance against the fire and destruction losses which rodents cause. Rat-free vessels need not be obliged to breast off from rat-proof, rat-free wharves. This facilitates the handling of cargo, because vessels may then discharge at the dock on one side and to lighters on the other.

It is equally necessary that vessels be prevented by other means from receiving rats while tied up to the wharf, or from discharging them under similar conditions. For this purpose, the use of proper rat guards on mooring lines is to be recommended, care being taken that the guards are always perpendicular to the line, and that they are of sufficient diameter to prevent rats from leaping over them. It is entirely practicable to construct a wharf and vessel in such a way that rats will be captured almost as soon as they get on them. For this purpose, when the dock is built, or the ship is laid down, suitable runways, which will entice the rats, should be installed. By means of swing doors, which operate from a platform, it is very easy, in this way, to capture all the rats on board of a ship, or on a dock. The rats are imprisoned in the runways, and can at any convenient time be driven by smoke or other means into a common chamber, the doors of which can then be shut and the rodents asphyxiated.

It is not, however, practicable at the present time to secure an immediate world-wide adoption of the measures above referred to. This is a matter for the coming years, one demanding and deserving our careful and continuous labors. In the meantime the periodic fumigation of ships for the purpose of killing the rats thereon is a most desirable measure. This may be accomplished by the use of sulphur dioxide produced by the old pot and pan method or injectep by one of the various types of machines devised for this purpose.

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The corrosive effect of this gas, however, and the deterioration which it produces on fine fabrics are serious objections to its frequent use, particularly upon vessels of the finer type. Carbon monoxide has been successfully used for this purpose and recently the United States Public Health Service has adopted a special apparatus for this purpose. If the larger steamships could be induced to install this apparatus on board and to use it themselves at frequent intervals much of the difficulties of the eradication of the ship-borne rat could be overcome. Just one point about the fumigation of ships to kill rats. No portion of the vessel should be overlooked. Lifeboats should be swung out and any rats contained therein should be driven out with live steam. Unless such measures are enforced with the greatest care a few rats will remain in spite of repeated fumigations.

In conclusion, it may be stated that where trade will go there rats will go, and where rats will go there plague will go. The relation between traffic and the spread of bubonic plague, therefore, resolves itself into the relation between traffic and the spread of rats. If this murine enemy of man can be banished from the highways of the world, if his isolation from the human species can be made complete and lasting, then shall we have won the victory over plague. That such a culmination will crown the labors of the working, teaching sanitarians of to-day is not beyond the bounds of possibility, but we must work, and we must teach, and we must by wise rules and regulations bring about an antipathy toward the rat which is greater than the present antipathy toward the snake. We must inculcate the lesson that the rat is the most expensive animal which man maintains, and that the limitation of this species, its isolation from the dwelling place of man, and the control of its migrations, are as important from an economic as from a humanitarian standpoint.

DISCUSSION.

Dr. TJADEN, Director of Laboratory, Bremen, Germany: Neben der Verbreitung der Pest durch die Nagethiere, d. h., diejenige von Mensch zu Mensch bei gewissen Formen (Lungenpest) ist nicht zu vernachlässigen, wie die Vorgänge in der Manchurei gezeigt haben, dass bei der Bekämpfung der Pest durch Rattentötung sollte nicht nur Werth darauf gelegt werden, im Eingangshafen auf infizierte Schiffe zu achten, sondern es sollten die Rhedereien durch internationale Abmachungen angehalten werden mittelst regelmässig wiederholter Räucherungen ihre Schiffe überhaupt rattenfrei zu halten. Die Möglichkeit dazu ist gegeben durch Verwendung von Kohlenoxyd und schweflicher Säure. Ersteres wird seit einer Reihe von Jahren in Hamburg verwendet; es tötet aber nur die Ratten und nicht das Ungeziefer und ist ausserdem ein gefährliches Mittel den

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Menschen schädigend. Die schweflige Säure hat den Vorzug, für Menschen verhältnissmässig ungefährlich zu sein. Es tötet das Ungeziefer und ist bei sachgemässer Anwendung für das Schiff und die Schiffseinrichtungen unschädlich. Bestimmte Verme vertragen die Behandlung mit schwefliger Säure nicht. Die regelmässigen Ausräucherungen der mit infizierten Fuhren versehenen Schiffe des Norddeutschen Lloyd zu Bremen mit schweflicher Säure haben den Erfolg gehabt, dass die Schiffe seit einer Reihe von Jahren bereits praktisch rattenfrei gehalten wurden.

Dr. FRANCISCO VALENZUELA, chief of disinfection, Superior Board of Health of Mexico, said that the last epidemic of plague in Manchuria showed that the rat is not the only carrier of the *Bacillus pestis*. In this epidemic were found many rats which were not infected with this germ. Therefore, the bubonic plague can be transmitted, not only by these means but also from man to man, through the respiratory organs. He is of the same opinion as Dr. Rucker, that the bubonic plague is transmitted principally by rats, but that in international traffic disinfection must not be confined to rats alone, but also to all objects near those suffering with plague. Among the disinfectants for destruction of rats in the ships, in his opinion the best is anhydrate of sulphur with Clayton's apparatus. It is being tried and practiced in Hamburg. The process of Dr. Nocht's, a mixture of carbon oxide, bioxid carbon, and azoe, is dangerous.

Dr. L. E. COFER: The point made in Dr. Rucker's paper that "plague is carried by rats, not by man," should be spread broadcast in order that it might be understood that vessels are fumigated to destroy rats long after human cases have appeared in the individual ports, rats, not man, being the agents of danger.

THE PREVENTION OF THE SPREAD OF CHOLERA OVER MARITIME TRANSPORTATION ROUTES.

Dr. R. H. VON EZDORF, Passed Assistant Surgeon, United States Public Health Service.

The occurrence of widespread epidemics of cholera in different parts of the world, together with the determination, in 1883, of the specific cause of the disease, namely, the spirillum of cholera of Koch, gave the impetus for the adoption of the modern preventive measures against the spread of this disease.

The epidemics of cholera occurring in Europe during the years 1892 to 1895 brought forth more prominently the importance of having the concerted action of the European nations, and resulted in international conferences, by which quarantine regulations against the spread of the disease from its endemic centers in the Far East

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were adopted. It was thus recognized that the only way to effectually prevent the spread of cholera was to attack its source, and the control of maritime transportation routes received first consideration.

The conferences held in Venice, in 1892, Dresden, in 1893, and Paris, in 1894, formulated important regulations with regard to the establishment of quarantine stations and their equipment on the Red Sea and Persian Gulf; regulations requiring the early report of the presence of infection in a territory, and the measures which should govern for the prevention of spread; regulations affecting vessels from infected or suspected ports, and the measures to be taken before departure, governing the vessels, passengers, water and food supplies, and, finally, the precautions to be taken during the voyage at sea.

As is known, the passenger travel thus affected was chiefly that of Mohammedan pilgrims on their way from India to the ports on the Red Sea en route to Mecca.

In the main, the regulations provided for inspection and disinfection of vessels; proper provisioning with pure water, taken from an uncontaminated source, and pure food; proper sanitary arrangements regarding quarters and latrines, and ventilation of these; adequate hospital facilities and disinfection apparatus; and that passengers taken on be free of disease, or, if previously exposed, that they be under observation in a place free from cholera infection for five days prior to embarking and, finally, that a medical supervision be provided on the voyage.

The United States was much alarmed over the prevalence of cholera in Europe during the epidemic of 1892, and greatly feared its possible appearance and spread to this side of the Atlantic during the year 1893. This apprehension on the part of the United States resulted in a passage of a law by Congress, entitled "An act granting additional quarantine powers and imposing additional duties upon the Marine-Hospital Service," which was approved February 15, 1893.

Accordingly, the Marine-Hospital Service, under the direction of the Surgeon General, framed the quarantine regulations which were promulgated by the Secretary of the Treasury.

The first set of quarantine regulations were those to be observed at foreign ports, and were promulgated February 24, 1893. On April 4, 1893, the domestic quarantine regulations were promulgated.

These regulations have from time to time been revised, adopting and recognizing the advances made in the study of the cause and spread of the quarantinable diseases.

The regulations that were enforced at the foreign European ports, on account of the cholera in 1893, provided for the mechanical cleansing and disinfection of vessels when necessary; the shipment and treatment of the cargo; with regulations governing the embarkation of passengers and crew, and the disinfection of their baggage.

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In the same year, 1893, during the latter part of August, one case of cholera, resulting in death, occurred in Jersey City. There arrived also, at our ports, but two vessels on which cholera occurred, one from Naples and one from Hamburg.

To the precautionary measures taken at the ports of departure, together with the special quarantine regulations enforced at our domestic ports, may be attributed the freedom from an epidemic invasion of cholera into the United States in that year.

Not since the epidemic of 1892–93, has the United States been seriously threatened, until the recent epidemics in Russia during the years 1908, 1909, and 1910, and in Italy during 1910 and 1911.

The special regulations on account of cholera, which were enforced at the foreign ports during 1910, provided that vessels should have pure water and a pure food supply, which must also be protected against contamination by flies; that water ballast should not be taken from a contaminated source; that certain fresh food products, fresh fruit and vegetables, coming from cholera-infected localities, should not be shipped; that steerage passengers and crew be detained five days, and all baggage inspected and, if necessary, disinfected, prior to embarkation; that cabin passengers coming from cholera-infected districts should produce satisfactory evidence of their exact place of abode during the five days immediately preceding embarkation.

Even with the careful enforcement of these regulations, vessels on which cholera occurred arrived in the United States from Italian ports as follows:

Steamship *Germania* arrived at New York on September 26, 1910, with one case developing active symptoms after arrival.

Steamship *Sant' Anna* arrived at New York on October 10, 1910, with one case en route.

Steamship *Moltke* arrived at New York on October 3, 1910, with one case, a fireman developing 11 days out on the voyage. A second case developed in an immigrant on the fourth day of observation at quarantine.

Steamship *San Giorgio* arrived at New York on November 17, 1910, on which two cases, resulting in death, occurred at sea, and one case in the same family was sick on arrival. The family came originally from a place in Sicily, supposedly uninfected, to Palermo, where they underwent a detention of five days prior to embarking.

During June, 1911, four infected vessels arrived at the New York quarantine station from Italian ports, namely: Steamship *Berlin*, on June 13; steamship *Europa*, on June 14; steamship *Duca degli Abruzzi*, on June 20; and steamship *Laura*, on June 21, and, with the arrival of the steamship *Moltke* on July 5, and the occurrence, on June 30, 1911, of two cases of cholera in the United States, one at Brooklyn, and one at Auburn, N. Y., in the persons of immigrants arriving on the steamship *Duca degli Abruzzi*, on June 20, 1911, and released from quarantine after being detained at least seven days, a

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longer period of observation than is required by quarantine regulations, prompted the issuance on July 18, 1911, of special quarantine regulations requiring that all steerage passengers coming from cholera-infected ports shall not be admitted until it has been determined by a bacteriological examination that they are not cholera-bacillus carriers.

This is but a brief review of the measures which have been adopted toward the prevention of the spread of cholera over maritime transportation routes.

During the summer of 1911, while detailed as special inspector for the Public Health and Marine-Hospital Service at the New York quarantine station, which was operated under the direction of Dr. Alvah H. Doty, health officer of the port of New York, I had occasion to study the history of each vessel, its passengers and crew, from the port of departure, during the voyage, and upon arrival, in connection with the operation of the new quarantine regulation regarding carriers.

A discussion of each of the measures that have been carried out, and such additional measures as might be deemed practicable to prevent the transmission of cholera from an infected country by sea routes, will now be given.

INFECTED PORTS.

Under the provisions of the International Sanitary Convention of Paris in 1903 and that of the American Republics in 1905 all nations have agreed to report the first appearance of cholera in their territories, the extent of such infection, and the measures adopted for its eradication.

It is hardly necessary to say that all this is important, in order that each and every country may take the proper steps toward protecting themselves as their particular needs and conditions warrant.

It is recognized that large numbers of persons, such as immigrants, whose hygienic conditions of living are far from satisfactory, offer the most likely means of spreading cholera infection.

It may therefore become advisable to limit the ports in a country from which such emigration may take place, in order that the forces may be concentrated, as far as possible, for the handling of large numbers of persons, a task which requires a large medical force and facilities for disinfection and detention. The sanitary conditions of a port must also be satisfactory.

VESSELS.

It has been known for a long time that cholera is spread chiefly by means of water and food supplies, and that general sanitation is an important measure for controlling its spread. These conditions on a

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vessel are absolutely under control, so that at the present time vessels engaged in large passenger traffic are built for the trade.

Cabin quarters are elaborately furnished, and there is no crowding.

Steerage passengers have their quarters below deck, where there are tiers of bunks arranged in upper and lower bunks, built of iron, and arranged so that cleanliness and free ventilation may be maintained.

The quarters of the crews are usually subdivided, so that each department, deck, engineers, and stewards is separate and distinct. Separate kitchens for the different classes are also provided.

There is also a general or observation hospital connected with a dispensary, located amidships, and an isolation hospital, usually located aft, for the isolation of any case of infectious disease. Steam disinfection apparatus is also installed on board.

No passenger vessels carrying emigrants should in this day be permitted to engage in this trade unless so arranged and equipped.

Under these conditions of living on shipboard cholera will not and can not become epidemic aboard, but will be limited to direct contagion from person to person. This condition is necessarily predicated on the assumption that the water supply is not contaminated and has been taken from a pure source.

I will mention one instance where the arrangement of modern construction in a vessel was taken advantage of upon the appearance of a case of cholera. The steamship *Europa* arrived at New York on August 25, 1911, having had a case of cholera in one of her firemen on August 16, 1911, resulting in death on August 23, 1911. The case was promptly placed in the isolation hospital, the firemen's quarters were disinfected, and the members of the engineer's department isolated in their quarters by means of wooden bulkheads. The quarters were furnished with their own kitchen and had all other conveniences, like bathing and toilet arrangements. On arrival of the vessel at her port a bacteriological examination was made of all steerage passengers and the crew, and none was found to be a carrier.

On none of the infected vessels arriving at the New York quarantine station was there more than three cases of cholera at one time. There were 11 cases of cholera among the passengers of the steamship *Moltke*, arriving on July 5, 1911, but these cases developed between July 11 and 18, during the period of detention at quarantine. There had occurred on board during the voyage of the vessel one case in a member of the crew, who had recovered and in whom the diagnosis was made on the agglutinability of his blood, the vibrio not being isolated. On an examination of the detained persons from this vessel, beginning on July 16, 1911, 15 passengers out of 201 examined and three members of the crew out of 51 examined were found to be healthy cholera-vibrio carriers. What factors entered into the

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development and spread of infection among the detained persons of this vessel remain unknown.

On none of the five infected vessels arriving subsequently at the New York quarantine station between July 15, and August 25, 1911, when the last infected vessel arrived, had there been any such spread of infection, as may be noted in the following histories of vessels:

Steamship *Perugia* arrived on July 15, 1911, having had two cases of cholera at sea; one in a passenger and one in a member of the crew; both diagnosed on the agglutinability of the patient's blood on his arrival, the vibrio not being found in the dejecta. A bacteriological examination of 257 passengers and 30 crew proved negative for carriers.

Steamship *Venezia* arrived on August 11, 1911, having had one case in a passenger, who died at sea. The diagnosis was confirmed bacteriologically from cultures submitted by the royal commissioner. On the examination of 681 passengers and 93 crew 1 passenger was found to be a carrier.

Steamship *Konig Albert* arrived on August 17, 1911, with one case of cholera in a member of the crew, confirmed bacteriologically. Three hundred and fifty-nine passengers and 190 crew were examined bacteriologically, and 1 carrier, a member of the crew, found.

Steamship *Re d'Italia* arrived on August 18, 1911, having had three cases of cholera on the voyage (all children), all of whom died at sea. Two of these were confirmed bacteriologically from cultures made by the Italian royal commissioner. One member of the crew was ill with the disease on arrival, whose infection was directly traceable to the other cases. There were 259 passengers and 122 crew examined bacteriologically, and 1 carrier, a passenger, was found.

Steamship *Europa*, arriving on August 25, 1911, had one case of cholera in a member of the crew. Three hundred and forty-six passengers and 126 crew were examined and no carriers found.

On July 30, 1911, the steamship *Duca di Genova* arrived with 546 steerage passengers, among whom, after 7 and 8 days' detention on board the vessel, 2 carriers were found, No sickness resembling cholera occurred during the voyage or while the vessel was for 10 days in detention at quarantine.

Another condition which contributes toward limiting the spread of infection on board is the fact that the different classes of passengers are not permitted to mingle with one another. For this reason, also, in handling an infected vessel each class may be safely dealt with as a unit.

PASSENGERS.

During the epidemic in Italy in 1911 the medical officers of the United States, stationed at the Italian ports, would not permit the embarkation of steerage passengers coming from infected districts, until after bathing and the disinfection of their personal baggage they had been detained five full days in a place free from possible infection. Some of these passengers were further subjected to a bacteriological examination for the purpose of eliminating healthy cholera-vibrio carriers. The detention of emigrants and the bacteriological examinations made at the port of departure in Italy were

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done under the direction of the Italian royal commissioners, to whose zeal, energy, and honesty the United States officers stationed in those ports certify.

The percentage of those examined among the number who embarked was, however, rather small in the beginning of the season, but later this percentage was much larger. The direct effect of this was also apparent in the fact that no infected vessel arrived in the period from August 25, 1911, to November 20, 1911, when domestic quarantine restrictions were modified, in requiring a bacteriological examination of all persons on infected vessels only.

Second-class passengers were permitted to stop at approved hotels and were kept under medical surveillance for five days immediately prior to embarkation.

First-cabin passengers were likewise registered in the best hotels and advised as to the precautions to be taken with reference to food and drink and the places to be visited during the time they were in the infected port. They were also required to give satisfactory evidence of their abode during five days immediately preceding embarkation.

No cases of cholera developed in any of the first and second cabin passengers arriving at the New York quarantine station, so that they were released from quarantine after a careful visual inspection.

It will be noted from this that the clinical standard of five days for the incubation of the disease was followed before permitting the embarkation of passengers; also, that in only a limited number of passengers, or those coming from places known to be infected, was a bacteriological examination made.

Experience has shown and proved that the clinical standard for protection was inadequate in dealing with epidemic conditions. With all precautions, vessels arrived at their points of destination infected. The clinical standard for the detention of persons in quarantine at the port of arrival also proved inadequate, and cases of cholera found their way into the country.

The explanation is plain. As early as 1892 Dunbar, working in Hamburg, showed that perfectly healthy persons who had never suffered from the disease may harbor the organism in their intestines, and thus be carriers of cholera. If such a person were uncleanly in his personal habits, he might readily contaminate the food and drink which is used by other persons, and sporadic cases of the disease might thus develop. Should it happen that a child were a carrier, and such a child should soil the deck of the vessel or floors of the quarters with its dejecta, where flies could have access, the chances of spreading infection by this means would be greater. The importance of freedom from flies and other vermin on board is therefore apparent.

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According to observations made by Passed Asst. Surg. A. J. McLaughlin, during epidemic times from 6 to 7 per cent of healthy individuals were found by him to be carriers of cholera vibrio, and they harbor these organisms for periods of from 10 to 20 days. Other observers cited by him have found that some carriers harbored the organism for as long as 69 days.

Where a large number of persons are taking passage on a vessel coming from infected territory, the danger of some voyager who is either a healthy carrier or one who has recovered from the disease being among them is apparent. The detention of five days prior to embarkation, and the voyage of 12 to 14 days, with the adoption of the clinical standard of five days' additional detention at the port of arrival, give an opportunity for many carriers to lose their organisms, yet they may, at the last moment, contaminate others just before landing, or they may harbor the organism for longer periods, and thus start infection in a country after landing. At the New York quarantine station 27 carriers remained under observation for periods of from 9 to 28 days before their final discharge. None was discharged until at least two consecutive bacteriological examinations, at intervals of two or more days, proved negative.

To meet these conditions it was necessary, therefore, to adopt the bacteriological standard rather than the clinical standard heretofore followed in our domestic quarantine practice.

As contact with a carrier is considered to be contact with cholera, it was necessary to reexamine a number of persons after a period of detention following the removal of the carrier. There were 405 steerage passengers and 53 of the crew reexamined bacteriologically, and on this second examination none was found to be a carrier. This reexamination was initiated before the expiration of five days; that is, specimens were taken about the fourth day. According to the experience of cholera workers in the Philippines, it is stated that cases develop within a period of 48 hours, and that this incubation period may be accepted and is considered a safe quarantine standard for practical work. Passed Asst. Surg. R. H. Creel, working in the New York quarantine laboratory, showed, in two experiments, that after the ingestion of some choleralike vibrios these vibrios were recovered from the stool within 30 hours. In all probability the same result must follow the ingestion of the cholera vibrio. The reexamination of contacts can therefore be safely initiated 48 hours after the removal of a carrier.

There is no doubt in my mind that, for the proper protection against cholera where an epidemic prevails, the bacteriological standard will have to be adopted either at the ports of embarkation or at the port of arrival.

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Preferably this bacteriological standard should be adopted at the point of embarkation. It has been shown that the clinical standard gives only a partial or incomplete security.

The detention of passengers at the ports of embarkation could also quite safely be made much shorter by at least two days.

The method of procedure proposed would be as follows:

Passengers of the steerage class would be bathed and their effect disinfected prior to entering the place of detention. At the end of 48 hours' detention a specimen of their dejecta should be obtained and examined bacteriologically for cholera vibrio, which examination can be completed within 24 hours. The examination proving negative, the individual group could be embarked with safety.

Granted that such examination of all steerage passengers has been made at the port of departure, the treatment of the vessel at the port of arrival could then safely be modified so that a bacteriological examination of all persons would need be made only in the case of infected vessels.

Where the clinical standard for embarkation has been adopted, then the only safe procedure would be the bacteriological examination of all persons on arrival, as was adopted by the United States in the summer of 1911.

It would seem, however, from the history of experience, that the clinical standard has its value, and I believe that it should be used where the infection in a country is rather limited; that is, where an epidemic does not prevail.

We had, for example, during 1911, vessels bringing passengers from Trieste and Marseille, where but a limited or scattering number of cases of cholera had been reported. Under the regulations these were infected ports, and all persons of the steerage class embarking in those places were examined bacteriologically on arrival, and none was found to be a carrier. I am satisfied that the clinical standard would have been sufficient in dealing with the passengers from those ports, supplemented, on the arrival at the United States port, with a bacteriological examination of those persons who, at any time during the voyage, had been sick with any form of ailment, particularly with gastrointestinal disturbance, excessive seasickness, and the like.

There is no question that the bacteriological standard should at all times be used in dealing with infected vessels. That it is practicable has been demonstrated.

INSPECTION AND DISINFECTION OF BAGGAGE.

The inspection of the baggage of passengers at the ports of departure is for the elimination of foodstuffs, such as sausage, fruits, fresh cheese, fresh milk, bottled waters, and so forth, as these articles may serve as culture media for the spirillum of cholera.

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The disinfection of baggage is required principally for soiled linen, bedding, and the like, which may have been contaminated with fecal discharges. It is known that the organism of cholera may live in feces as long as 163 days, so that any articles which might have been or are exposed to such infection should unhesitatingly be disinfected. Dry, clean clothing requires no treatment.

CARGO.

Under the quarantine regulations, certain food products, such as sausage, dressed poultry, fresh butter, fresh milk, fresh cheese, if exposed to infection, are not allowed to be shipped. Fresh fruits and vegetables may be shipped only if they have not been exposed to infection. Rags used in the manufacture of paper are required to be disinfected.

New merchandise, ordinarily shipped, is not liable to become contaminated under the conditions of modern manufacturing processes, so that no restrictions need or would be offered. This is in accord with the International Sanitary Convention of Paris, 1903, which reads:

ART. 11. No merchandise is capable by itself of transmitting plague or cholera. It only becomes dangerous when contaminated by plague or cholera products.

The next article, 12, provides for disinfection of body linen, clothing worn, bedding, and rags.

During the summer of 1911 cargoes on vessels arriving from cholera-infected ports were not interfered with, and no treatment of cargo was at any time thought to be necessary.

ON THE VOYAGE.

A medical supervision on the voyage is essential, in order that any illness of a suspicious nature may be dealt with at its incipiency, and that isolation and disinfection may be practiced.

A daily inspection of all persons on board, making a count at each inspection, is therefore necessary. A supervision of food and drink should also be included, together with an inspection of the sanitary conditions prevailing on board.

The medical officer for this work should be detailed for duty on the vessel, and should preferably be a government officer. His authority regarding medical matters should be absolute. In this way only can the influence of ship's officers and owners be overcome.

The Italian Government, under its laws, requires that a vessel carrying Italian emigrants should have on board a medical officer of the Italian Navy, whose designation is that of Italian Royal Commissioner. During the epidemic of 1911 the services of these officers were invaluable in detecting cases of cholera and carrying out the

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preventive measures required. They were also prepared to make and often made cultures of the dejecta of all suspected cases, which, in a number of instances, was the only means for confirming the true character of the disease.

That the measures were properly and effectively carried out on infected vessels undoubtedly contributed to limiting the spread of infection on the vessels whose histories have been given.

In the case of the steamship *Europa* already cited, much weight was given to the measures adopted, so that it was possible to release the vessel after one day's detention required for making a bacteriological examination of the steerage and the crew.

CONCLUSIONS.

The following conclusions relative to the prevention of spread of cholera are given:

Cholera is spread from place to place along routes of travel either by persons who are sick with it or by healthy cholera-vibrio carriers. As emigration from infected territories of large numbers of persons of the lower class, among whom all hygienic rules are violated or disregarded, is the most dangerous source of infection, restrictions must be made to meet the conditions.

Ports where emigrants are embarked should be limited in number.

Vessels carrying emigrants should be of modern construction, with every provision for the supply of pure water and pure food. Ventilation, cleanliness (which includes freedom from vermin), sanitary arrangement of latrines, separate kitchens, isolation hospitals, disinfection apparatus, and a clean personnel are essential, and should be a requirement before permitting the embarkation of passengers of the steerage class.

Cabin passengers should not be embarked unless they have been under medical surveillance for a period of 5 days immediately prior to embarkation, or unless they have not been exposed in any infected place during 5 days prior to embarkation.

Steerage passengers coming from infected or suspected territory should be bathed, and their baggage disinfected, immediately before being placed in detention and observation. This detention should be for a period of 3 days (if a bacteriological standard is adopted), divided as follows: At the end of 48 hours, a specimen of the dejecta is obtained for bacteriological examination from each person in a group, and the remainder of the time of detention used in completing this examination, when they may be embarked without further detention, if found not to be cholera-vibrio carriers, and if on final inspection they appear in good health.

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If the clinical standard is adopted for steerage passengers coming from infected or suspected places where an epidemic prevails, who embark after 5 days' detention, they should be examined bacteriologically at the port of arrival before being permitted to land.

The bacteriological standard is recommended and should be adopted at ports of embarkation in times of widespread epidemics.

The clinical standard of 5 days' detention prior to embarkation for persons of the steerage class should be adopted at ports where a limited infection is present—that is, no epidemic condition prevails in the country. This is to be supplemented by a bacteriological examination at the port of arrival of those persons who had been sick during the voyage.

That all passengers and members of the crew be under daily medical supervision during the entire voyage.

That any arriving infected vessel—that is, one on which a case of cholera has appeared at any time during the voyage—should not be released until all persons in the steerage, the crew, and any others who may be deemed to have been exposed to infection, have been examined bacteriologically, to determine whether they are cholera-vibrio carriers.

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DISCUSSION.

Dr. McLAUGHLIN, United States Public Health Service: At first glance the suggestions made in Dr. von Ezdorf's paper may seem radical, or make it appear that a retrogressive step is being taken. Upon closer scrutiny, however, it will be found that these suggestions are based upon certain results which have been uniformly reported by all workers in cholera outbreaks. It was my experience that, during epidemics, sometimes 6 or 7 per cent of carriers were found, while during small outbreaks of a few scattered cases several thousand stools will be examined before the first carrier is found. So that the results from examining stools from districts with a few scattered cases will scarcely justify the time consumed or the inconvenience occasioned. The limiting of bacteriological examination to the

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lines suggested by Dr. von Ezdorf is sane in theory and will be found safe in practice.

Dr. MONTIZAMBERT, Director General of Public Health, Canada: Bacteriological examination of steerage immigrants from cholera-infected countries is carried out in Canada. Among the cholera carriers I found one who, after a light attack of cholera, continued as a positive cholera carrier for five months, from the middle of November to the middle of April, negative results being obtained only in May. This would seem to be the longest period of cholera carrying as yet recorded.

THE SUPERVISION OF THE MIGRATION OF TUBERCULOUS PATIENTS.

Dr. WILLIAM F. SNOW, secretary of the State Board of Health of California, Sacramento, Cal.

[Abstract.]

1. The probable extent of migration—the States chiefly concerned—the difficulties of obtaining accurate information relative to the movements of tuberculous patients.

2. The factors inducing migration: Mild climates—the out of doors—altitudes in the West and South—labor conditions.

3. Factors in regulating migration: State methods of registering tuberculous patients—methods of obtaining special data concerning migratory cases—necessary facilities for diagnosis and treatment of patients.

4. Factors favoring and against migration:

(*a*) Favoring migration: The stimulation of complete change—better discipline probable—certain advantages of climate and elevation—special medical and nursing supervision.

(*b*) Contraindicating migration: Advanced stages—lack of facilities to care for cases properly in new location—limited funds—poor labor conditions for early cases.

5. Present needs and future possibilities:

(*a*) Imperative need for some plan of reciprocity among the States in care of bona fide indigent residents, who have migrated from their residential States—possibility of applying present methods of reciprocity in care of the insane.

(*b*) Need for United States Government provision for migratory cases clearly not bona fide residents of any State—feasibility of the suggestion of the southwestern conference that the Government's old Indian forts be converted into sanatoria.

(*c*) Possibility of adopting England's new plan of compulsory insurance to provide adequate sanatorium treatment of tuberculous patients.

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(*d*) Possibility of requiring transportation certificates of all migrating tuberculous patients—the difficulties and necessary administrative machinery for such a plan—its advantages—the possibilities of adapting to this purpose the existing regulations for permits for the transfer of dead tuberculous patients.

ELIMINATING TYPHOID FROM RURAL COMMUNITIES.

HAROLD B. WOOD, M. D., D. P. H., health officer, Rochester, Minn.

The conditions of living and of labor existing in rural communities demand an aggressive attention from those who are concerned in the upbuilding of a nation and in the conservation of its vital resources.

The consideration which is being given to typhoid fever in rural communities and small towns is not keeping pace with the development in the activities against this disease in large cities. Since nearly one-half (48.2 per cent in 1910) of the deaths from typhoid fever in the United States registration area are classed as rural, the subject undoubtedly deserves greater attention upon the part of Government and State officials. It is a State's problem and of widespread concern. On account of its general and variable character, it demands more than the local work usually commenced by inspectors only upon the appearance of an outbreak. Some means need to be developed by which State or Government forces may work to overcome these rural epidemics through cooperation of the statistical, laboratory, engineering, and epidemiological bureaus, without the necessity of keeping a large force of inspectors in the field. Upon a practical basis the work is difficult, because, in their lethargy and indifference, most communities refuse to become aroused until many avoidable deaths occur.

When an outbreak begins it is commonly regarded of but local concern, and no special attention is given until, unable to cope with the situation, the local officer calls upon the State officials for assistance. Although situated but locally, each outbreak is actually of greater mportance because of the undoubted present and future widespread danger or damage. The prevention of these outbreaks is the State's concern and should be under the State's jurisdiction.

The evident methods of preventing the outbreaks of typhoid, so widely and constantly possible, include the classification or mapping of factors of water carriage, lines of travel and transportation and geographical dissemination, topographical and geological data; the collection of sociologic health statistics as a means to determine through what local avenues infection is apt to occur; public instruction in the cause, the transmission, and the prevention of disease; the gratuitous advice for applicable systems of water supply, sewage

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disposal, and the handling of food products; and the common sense enforcement of practical requirements.

The proper system of control of the developed typhoid situation includes the elements of correct diagnosis, early and complete notification or recording of cases, and an appreciation by all physicians of the possible avenues of transmission. The public danger and the economy involved justify the requirement of complete reports of all data having important bearing upon the propagation and transmission of typhoid fever. Only by receiving early and complete reports can the health officer perform his duty. The difficulties encountered in accomplishing his work are principally through the existence of ambulant carriers or other cases which resist diagnosis.

As a means to the development of the field of control, several Governments and several States in the United States have adopted some plan of field inspection, and great good has been accomplished.

The methods of policing territory are effective, more from executive vigor and financial backing, than from the particular systems adopted. The establishing of typhoid stations in Prussia, the topographical territorial districting of New York, the patrolling of watersheds, as practiced in a number of States, the dependence upon local men, each with jurisdiction over an individual county or number of counties, as adopted in Massachusetts and Pennsylvania, or the use of a few men to cover an entire Commonwealth, each method has advantages of more or less local concern.

The most promising system appears to be that involving the employment of a central epidemiologist with field assistants.

Until the appointment of a State epidemiologist, who investigates the typhoid incident of rural communities after it has assumed the volume of an outbreak, or has become of endemic character, little activity is usually extended against typhoid among small or scattered populations.

The traveling epidemiologist checks the epidemic. He waits until apprised of an outbreak which has already commenced. His work should be preceded by that of another from the central office. This man labors to prevent, not to check epidemics; he is a medical sociologist, as it were. His is the work of compiling and comparing statistics of those factors which affect the birth, morbidity, and death rates, as a means for the formulation of methods for the eradication of disease. These factors of community, of living, of education, and of industry, coupled with records of vital statistics, form a basis for practical sociologic health work.

He knows each community, its geology and topography, its water supplies and drainage, its races and industry, its weighted morbidity and mortality rates, and its conditions which favor or retard the induction, transmission, and dissemination of disease. He would be

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of material assistance to a man who, before going into a particular locality, inquired concerning the various conditions to be encountered. He is able to furnish to a man in the particular community much information, at least, if not definite directions, about courses to adopt in regard to improving local living conditions. Housing problems and social reform are developed upon such knowledge.

The information gathered would be of material assistance to a publicity or educational bureau. It may be used to develop reasons for local sanitary inspectors, courses of lectures, or traveling exhibits. In the development of the public health, this work logically tends to replace the field epidemiologist. It is the alpha of prevention.

This bureau obtains its information through various agencies, from other State departments, from the bureau of statistics, from the laboratory, from field agents, or local men. Owing to the constant changing of local living conditions, constant revision is necessary.

The percentages of the different methods of probable typhoid transmission are variously estimated, the influencing factors being probably different habits of living adopted in various localities. The modern sanitarian must consider more than simply a suspicion of flies, fingers, and food. To condemn flies in a particular instance, because no proof was established against the milk, is not enough. It must be ascertained by what means each possible factor may play a part. The porosity of the local soil is probably an important point. Water pollution would be of greater consequence where clayey soils abound than with more porous strata. Water pollution would probably be a great factor in rural typhoid tramsmission with the following combinations: Open-box privies, with impervious soil; cesspools with sandy or rocky soils; absence of regular places for sewage disposal with sandy soil. The combination of private shallow wells with yard closets in compact towns means typhoid. The closeness of a well to the house would probably increase the possibility of typhoid infection of the water, but decrease general sewage pollution of the supply.

The water transmission is undoubtedly a greater factor in localities with box closets than in those without privies. In hookworm communities where thoughtless widespread surface pollution is in vogue, fly infection is probably of less importance than in towns with toilets in the yards. Where hookworm disease abounds, water pollution may be considered the strongest factor in the spread of typhoid. By collecting the detailed data of the various factors in each particular instance, effective directions for decreasing the infection can more intelligently be supplied.

As villages increase in size, the subjects of a public water supply and of that of public sewerage are considered by the citizens, the private wells being usually eliminated years before the yard toilets.

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If the surface soil is comparatively porous, and the soil polluted, the wells should be eliminated first, they being the greater danger. If, however, the records apparently indicate that the typhoid is mostly fly borne, and that the impervious surface soil protects the wells from pollution, the town should consider sewerage before a public water supply. Flies are legitimately shadowed by suspicion, when the records show that the houses are not screened, and where box privies are in general use. Where shallow open wells with near-by privies exist, or in localities where the common custom of throwing house wastes upon the ground prevails, or with well-screened houses, the water supplies need remedying. The combination of shallow or deep private wells, and cesspools within small yard areas, would point toward pollution of the ground water.

As a means of collecting information or in overcoming rural transmissible disease, morbidity statistical report blanks should advisedly contain a space for recording any connection the patient might have had with any possible avenue of transference of the disease. The name and location of any school or place of public gathering, the location of any store or factory in which foods or dress goods are sold or handled, together with the specific employment enjoyed by the patient in such industry, may be recorded upon the morbidity report. This information, when received by the local registrar of statistics, is to be forwarded to the proper authorities, who may thereby take the necessary steps to guard the public health. Should the patient or his family be in the dairy business, shipping milk from the country into a city, this fact should be recorded, when the diagnosis is typhoid fever, or one of the several other diseases which may be milk borne.

The local registrar should notify the local health officer in the city into which the suspicious milk is sent, giving name and location of the dairy, together with a description of all means used to prevent transmission.

The same system of cooperation between the local registrars or rural health officers and the health officers of towns within the same precincts should operate in regard to reporting the location of all transmissible diseases which may be food or water borne.

Pamphlets of information upon measures to check the transmission of typhoid fever may be mailed from the central office to each rural household from which the registrar of statistics received reports of typhoid cases. To the physician should be sent blank postal cards, upon which he is to indicate what means have been adopted to check contact, and to prevent infection of food and water.

Many health boards regularly circulate bulletins or reports among physicians and others. They are of value, but perhaps more public

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educational health work would be accomplished if these publications were less voluminous, and were used more for public instruction. For use in health campaigning, the circulation needs to be increased to reach those for whom the particular pamphlets are intended. They should go to the masses of the people. In rural districts these people may be reached by pamphlets sent to superintendents of education, who distribute them among the district school-teachers. Each bulletin received by a teacher may be a number of separate leaves upon some simple subject, to be distributed among the scholars to read in school, and to take to their parents. The use of health bulletins as textbooks for reading in the schools is an effective method.

State laboratories, in making the bacteriological examination of water for pollution, should obtain data relative to the water supply and its probable contamination before reporting the results of the examination.

This information is obtained by sending to the physician a blank form for data of the character of the water supply, its topographical location and distance from various specified polluting points, its depth, if a well, and the character of the subsoil, with any available history of the careless disposal of typhoid discharges. Then directions for improving the water supply or its surroundings, with means for disinfection, as by chlorination, can more intelligently be supplied. After the use of chlorinated lime, a reexamination seems advisable.

The value of a chemical analysis of a domestic water supply to determine its wholesomeness has been somewhat overestimated. The general consumer desires to know if his water supply will produce disease, as, for example, typhoid fever. For this the bacteriological examination is most promising, since the chemical analysis does not indicate that the pathogenic organisms are still alive or numerous.

Too much dependence should not be placed upon a single laboratory bacteriological examination of a sample of water sent by a physician as representing the water supply of a household having a case of typhoid. Colon organisms may be isolated, but they may have come from the lower animals, or from the carelessness of people at the pump. With the examination for colon bacilli, a test for the chlorine content may be of advantage in confirming the findings. However, the identification of colon bacilli in a water supply is at best but a presumptive test. To state that "a water showing 2,000 bacteria should be reported as filthy" is as unwise as to condemn a suspected well without attempting to discover and to correct its faults.

Of the private water supplies examined in Ohio (1909), 80 per cent were found polluted. Typhoid fever was present in one-fifth of these homes. Where the surroundings were stated to be good, 30 per cent of the private wells were found to be contaminated; but in

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the presence of unsatisfactory surroundings, 77 per cent were found polluted.

Increasing the depths of wells to below an impervious strata decreases rural typhoid. This was shown in the little town of Wesson, Miss., where, with many shallow wells, typhoid was endemic. Deepening the wells decreased the morbidity from 167 in 1910 to 1 case in the following year. This one case was in a man who persisted in drinking from an old shallow well. Open-box privies are in vogue in the town.

Rural typhoid factors other than water supplies do not receive sufficient consideration by local health officers, one of whom, because of recurring cases of typhoid in one household, sank four 60-foot wells within a radius of 20 feet, when all polluting points were distant, and while a negro typhoid-carrier case, cooking occasionally for the family, continued to introduce the infection. The urgent need of efficient local health officers who are trained for the work is apparent.

In the Southern States a sanitary survey by the field directors of the Rockefeller Sanitary Commission shows that of 56,012 rural homes inspected, 26,423, or 47.1 per cent, were without any regular locality for sewage disposal. The use of so-called sanitary closets, with the pail system, is being universally recommended. Owing to the expense involved, and to the lack of appreciation of its importance, the system is not meeting with the success its value merits. The question of local practicability of the adoption of closet systems is not sufficiently considered by health officials. Rapid advancement causes too great a revolution of ideas; improvements in modes of living come gradually. So greater success would be obtained in hookworm infested regions by recommending the adoption of simple earth pits as the next expediency to no privy. After this slight advance, further development is more easily accomplished. It is well to have a guiding star, but the approach needs to be gradual.

Practically all the rural homes in the North, and 50 per cent of those in the Southern States, are equipped with open-box toilets, which admit flies and pollute the surface. The great advantage of obligatory screening of these from flies is shown by the marked reduction in typhoid in the outlying districts of Jacksonville, Richmond, and other places where the practice is enforced.

In advising the public in regard to sewage disposal, local conditions must always be considered. Advice which is not locally practical will not be heeded; that which exceeds the minimum conditions of finance or convenience will scarcely be adopted without compulsion. Neither should the working phrase "the best or nothing" be uncon-

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ditionally adopted in preference to the idea "a satisfactory improvement is an advance." To attempt the ideal frequently means to accomplish nothing.

In considering or criticising a custom, even though it be insanitary, a practical and reasonable substitute should be offered. Every man wants that which will come within his means of finances and ability to construct and maintain, else he will little consider an improvement simply because it is stated to be safer from a standpoint of health.

To unqualifiedly condemn cesspools is to lose a disposal method which has considerable value within limited fields. Frequently a cesspool is the alternative to surface pollution, and, of these, the fly-free hydrolysing reservoir is the lesser evil. All cesspools are more or less leaching, except in an impervious subsoil, and the danger to water supplies may be less from these than from thoughtlessly placed surface privies in some localities. A cesspool should be so located that the pollution of the water supply is impossible. A correctly located liquefying tank, with an automatic or siphon overflow with subsurface discharge, is clearly an ideal method for many localities, even in some openly built towns with public water supply To attempt the ideal is frequently a loss of time, but to suggest means leading to an advance is to accomplish much.

Whatever system is advised, the country dweller may become a menace if the location of his toilet is left to his own judgment. There should be indicated to him the exact spot to obtain his water supply, or locate the sanitary conveniences, or he should be supplied with unmistakable descriptions. Wells, cesspools, toilets, barns, milk rooms, spring houses, or kitchens should not be located at the rural home according to convenience alone, but according to plans and ideas which will protect the health of the people. It is these problems of housing and living reform, these advances in safety, now demanding the attention of health officials, which will do much to overcome preventable sickness and death, and lend an added attraction to rural life.

DISCUSSION.

Dr. CHARLES BOLDUAN believed that organization of the rural public health service on county lines was one of the most important things to work for. In speaking of the engineering difficulties in securing pure water from the Great Lakes, the speaker described an outbreak of typhoid fever in a lake city some years ago, embracing about 125 cases. Water supply was drawn from the lake, and sewage discharged into the lake, the two sets of pipes being laid in the same trench. The water pipe was laid 600 feet out beyond the water's edge where the sewer pipe emptied. During a storm, a scow had dragged anchor over the water pipe, and had broken it about 75 feet

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beyond the sewer outlet, and the town had merely been pumping diluted sewage, and thus infecting the inhabitants with typhoid fever.

Dr. LUMSDEN, in discussing Dr. Wood's paper, emphasized the necessity for the creation and maintenance of efficient county health organizations in order to bring about desirable sanitation in rural districts, and deprecated the adoption of any halfway measure in carrying out a campaign of education to induce persons in rural districts to install sanitary privies. A sanitary privy was defined as one which was fly proof and provided with a water-tight receptacle for the excreta. The shallow pit advocated by Dr. Wood was insanitary and dangerous, particularly in limestone sections, and it was really questionable if such privies in many instances were not more dangerous than promiscuous defecation, since small deposits of excreta would be exposed to sunlight and to rapid drying in most climates. A campaign of education which would cause farmers to build halfway sanitary privies would, if carried a few lines further, persuade them to build wholly sanitary privies. The health worker who does not succeed in getting people in his nonsewered districts to build and use sanitary privies is simply not on to his job.

THE ORIGIN AND PREVENTION OF TYPHOID FEVER.

Dr. W. FORNET, Stabsarzt an der Kaiser Wilhelms-Akademie, Berlin, Germany.

The campaign against typhoid fever, started in 1904 in the southwest of Germany, has met with remarkable success. It has taught us, however, that typhoid fever sticks to the place where it has occurred once. To begin with, these typhoid villages have to be pointed out by reliable statistics. If possible, all the inhabitants of these villages must be examined bacteriologically. If that be done, one is absolutely sure to find one or more bacillus carriers or typhoid hosts, as I prefer to call them, as the last source of at least three-fourths of all the cases of typhoid fever that have ever occurred in that place. These typhoid hosts are a public danger, but only so long as they are dirty; effective hygienic teaching makes them, with rare exceptions, harmless.

Typhoid hosts are not so frequent—little more than 2 per 10,000 inhabitants, indeed. The fact that I could trace 31 families, of which 2 or even more members were typhoid hosts, makes it likely that a second infection with typhoid bacilli often makes people bacillus carriers, a theory that I could partly verify by the results of my experiments on animals. Things being so, here, too, cleanliness alone can do much in preventing this undesirable condition. If convalescents of typhoid fever, inoculated persons, nurses, and other immune persons were to protect themselves by strict cleanliness

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against a reinfection with the germ of typhoid fever, no more persons would become typhoid hosts, and with them typhoid fever would disappear altogether.

But as long as not all the typhoid hosts can be detected, and made harmless by hygienic teaching, as long as the origin of fresh typhoid hosts can not be prevented, and as long as the typhoid hosts can not become free from their typhoid germs, we must try by inoculation to protect the population against typhoid fever. Vaccination ought to be made compulsory for the whole population, as it is already for the United States Army. But we can not expect to make inoculation against typhoid fever compulsory, before we have learned to vaccinate without hurt.

THE PREVENTION OF WATER-BORNE DISEASE IN LAKE AND RIVER TRAFFIC.

ALLAN J. McLAUGHLIN, passed assistant surgeon, United States Public Health Service, Washington.

To prevent the spead of water diseases in lake and river traffic, it is necessary to keep the polluted water from each of the passengers and the crew. The difficulty in effecting this may be appreciated by considering the question of supply and of use. What sources of water supply are available, and of passengers will? These

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from shore. In this deep lake the placing of such an intake would often present engineering difficulties and necessitate expenditures which would be in excess of the cost of other methods of rendering the water safe.

LAKE HURON AS A SOURCE OF WATER SUPPLY.

As a source of water supply Lake Huron is ideal. Its enormous storage capacity insures storage for years of the amount of water flowing into it. In other words, if all inflow were stopped, it would take years for this great basin to empty itself by losing daily the present average daily flow through its only outlet—the St. Clair River. This fact of enormous storage, with the sedimentation and great dilution afforded, narrows the question of sewage pollution to one of local significance, so far as Lake Huron is concerned.

Owing to the enormous volume of water in Lake Huron, and to the small size of the communities situated thereon, sewage pollution does not alter the general quality of the lake water, except for a few miles in the vicinity of the sewer outfalls. The sewage of the cities in the Saginaw Valley constitutes an exception. The polluted Saginaw River, emptying into Saginaw Bay, renders the water of Saginaw Bay unfit for drinking purposes without treatment or filtration. At certain seasons this pollution would be evident because of currents and the shallowness of the bay for many miles. Outside of Saginaw Bay and Thunder Bay, in the vicinity of Alpena's sewers, the water of Lake Huron receives only a negligible quantity of pollution and should be of excellent quality.

LAKE MICHIGAN AS A SOURCE OF WATER SUPPLY.

Lake Michigan is 307 miles long and has a maximum width of about 118 miles. The maximum depth is 870 feet. The storage capacity is enormous, and its power to oxidize and purify organic matter can scarcely be overestimated. The effect of storage of Lake Michigan water is accentuated by the comparatively small outflow (an average of only 57,000 cubic feet per second through the Straits of Mackinac). For example, compared with Lake Huron, the area of water surface is nearly the same—over 22,000 square miles—and the maximum depth in Lake Michigan is about 100 feet deeper than that of Lake Huron.

The outflow of Lake Huron at Port Huron is about 210,000 cubic feet per second, while the outflow from Lake Michigan is only about one-fourth as much. This means longer retention of polluted inflow from rivers and sewers, and more opportunity for purification before discharge through the Straits at Mackinac. It would take Lake Michigan many years to empty itself at its present rate of outflow,

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even if all inflow were prevented. Under these circumstances, the quality of Lake Michigan water must be good, provided we can get it far enough from the polluting inflow of rivers and sewers. Unfortunately, the zone of polluted water extends a considerable distance out into the lake from the water fronts of the cities and the mouths of the large rivers, and this zone of pollution has no constant boundaries, because of currents due to wind and flood, but under unusual weather conditions extends far beyond the point which seems safe in quiet weather.

LAKE ERIE AS A SOURCE OF WATER SUPPLY.

The importance of Lake Erie as a source of public-water supplies can not be overestimated. At present there is an urban population on the United States shore of a million and a half of people. The density of population is bound to increase, and scarcity of other adequate supplies makes the adjacent population dependent upon the lake for water supplies for all time to come. Lake Erie contains 17,500,000,000,000 cubic feet of water, which affords storage for the water discharged into it for a period of about 920 days.

This great natural reservoir, with a capacity of 920 days' storage, assures a high degree of purification by natural agencies, such as dilution, aeration, and sedimentation, besides affording the storage time necessary to permit of the natural death of pathogenic bacteria. The ability of the natural agencies operating in the lake to render sewage innocuous is very great, so that water at the center of the lake is comparatively pure.

Where the sewage is poured into the lake in great quantity, especially near the mouths of rivers upon which large cities are situated, the zone of polluted water is wide, and a greater distance toward the lake center must be traversed before pure water is secured. With the growth of urban populations on the lake shore, this zone of polluted water is continually widening, and waterworks intakes have been repeatedly moved farther out to secure better water. In the danger of polluted water entering waterworks intakes there is another factor besides the ever widening zone of polluted water, namely, the action of currents.

LAKE ONTARIO AS A SOURCE OF WATER SUPPLY.

Although Lake Ontario is the smallest of the Great Lakes in superficial area, it contains a much greater volume of water than Lake Erie, because of its greater depth. The maximum depth of Lake Ontario is 738 feet. The area of the water surface is 7,243 square miles. Allowing an average depth of 250 feet, the storage capacity of the lake would be 50,480,812,000,000 cubic feet. The discharge

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from the lake by the St. Lawrence River is about 250,000 cubic feet per second, or 21,600,000,000 cubic feet per day. At this rate of discharge, Lake Ontario would require 2,337 days, or over six years, to empty itself, if all inflow were stopped. This is a conservative computation, and it may be reckoned that given proportions of water contributed to the lake at the western end will have the benefit of over six years' storage before making their exit into the St. Lawrence River. This means that the water in Lake Ontario is capable of purifying an enormous amount of organic matter, and that with the existing pollution the water should be pure outside of the zones of pollution surrounding the water fronts of cities and the mouths of large rivers.

The connecting rivers between the Great Lakes are all polluted by sewage, and their currents and length are such that natural purification is ineffective and does not render them safe as sources of supply without further treatment.

It will be apparent at once that water taken from the rivers without treatment is unfit for drinking purposes, and that safe water can be constantly obtained from the lakes only by avoiding the shore pollution. This necessitates taking water many miles from shore, as the boundaries of the shore pollution are very variable, owing to winds and currents.

It is a very difficult matter to restrain ignorant or careless individuals from drinking unfiltered surface water, and members of the crew and sometimes the passengers on river and lake steamers have no hesitancy in drinking water direct from the river or from the lake within a few miles of shore. These people can not be restrained by law or regulations. The only remedy is a campaign of education showing the dangers of untreated surface supplies.

II. WATER TANKS OF VESSELS.

The water tanks of vessels may, and often do, contain polluted water. The river steamers usually carry water obtained at some of the ports of call. The lake steamers may secure their supplies in the same manner, but frequently take their supplies from the lake itself. They usually fill their tanks while in midlake, where the water is comparatively pure. That they do not always do this is attested by at least one very serious outbreak of typhoid fever on a lake steamer.[1] It is said that this vessel filled its tanks in the Detroit River not far below the city of Detroit.

If we permit the custom of filling tanks in midlake we must necessarily place implicit trust in the ships' officers. This has resulted in disaster, as cited above, and we never know when it may occur again, as a result either of ignorance or of carelessness.

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Another danger exists in the use of foul sea cocks and pipes. The great danger from this source was pointed out by Surg. J. O. Cobb,[2] of the U. S. Public-Health Service. It is frequently the custom to use the same system of sea cocks and pipes for drawing the polluted water from harbors and rivers, while in port, and for filling the water tanks in midlake.

III. PUBLIC WATER SUPPLIES AT PORTS OF CALL.

Not only are the public-water supplies of ports of call frequently the source of supply for vessels, but they are also furnished to the interstate visitors who land in such ports.

In regard to public water supplies, the conditions which make disaster possible where the source of the supply is polluted are two, namely, (1) failure to purify; (2) inefficiency of purification.

The failure to install a purification plant is usually due to an undue confidence in a water supply, which is "safe most of the time." It is difficult for some officials to understand, without a severe lesson, that it is not sufficient to have a water supply that is safe for 360 or 361 days in the year, and to these officials it seems scarcely justifiable to require expensive purification for the sake of the four or five days in the year during which, owing to weather conditions, pollution may take place. Such a supply, with a favorably placed intake, may escape pollution for more than a year. There was no evidence of serious pollution of the water supply of the city of Erie during the year 1909, yet the appalling disaster of January and February, 1911, showed that pollution could take place under certain weather conditions.

There is also too much confidence placed in unfiltered surface supplies from inhabited watersheds. Even where there is alleged control of the watershed, and ample storage, pollution may occur. In regard to unfiltered surface supplies the need of bacteriologic control is very evident. Dangerous pollution may be present only for a few days or for a few hours.

The bacterial count per cubic centimeter is valuable, but the quantitative estimation of *B. coli* is of far greater importance. A low count does not necessarily imply a safe water, but a low count, coupled with absence of *B. coli*, may be considered an index of safety.

In Europe surface supplies are almost invariably filtered, and eventually such supplies in America will be treated or filtered.

Poor filter efficiency is often responsible for disaster in the shape of typhoid outbreaks and may be due to several causes. The slow sand type may give poor filter efficiency when sufficient extra units are lacking, necessitating excessive rates and the placing of "green" filters in service. Excessive rates, too little coagulant, insufficient

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sedimentation capacity, and insufficient storage are common operating and structural faults of the mechanical type. Sometimes a properly constructed plant is struggling with raw water which has a high bacterial content, and, even with fair filter efficiency, yields an unsafe effluent.

Probably the greatest single cause of a poor effluent from filter plants is inefficient operation by unskilled men. It is absolutely essential for good results that bacteriological examination, including *B. coli* estimation, be made at least once daily, and, in slow sand plants, from each unit separately.

The man in charge must be able to do this. In mechanical filter plants or with hypochlorite plants he must also have the skill necessary to adjust his chemicals with nicety according to the changes in the raw water. With such a man in charge of a properly constructed plant, a safe effluent is assured at all times. When struggling with a bad raw water, he will use hypochlorite as an adjuvant with good results. He will study the peculiarities and fluctuations of the constituents of the raw water and adjust his treatment accordingly.

The most serious defect in sanitary control of our water supplies is the lack of proper daily bacteriologic examination of the water and quantitative estimation of the *B. coli* content. In some of the lake cities there is proper daily bacteriologic examination of the water supply, but in many of them there is either an imperfect examination or none at all. One city with a slow sand filter plant of three units, and a consumption equal to the safe filter capacity of the beds, operates these without rest, putting the units in service "green," with an occasional examination of the water of, say, once or twice a month.

The significance of polluted water supplies in large industrial centers from an interstate standpoint is enormous. Trains and steamboats take their water supplies at such points, and this polluted water is drunk by the passengers throughout the trip. Common carriers in interstate commerce also contribute to the spread of typhoid in interstate traffic by failure to have their railroad trains and steamboats provided with retention tanks for excreta. Human excreta may in this way be deposited in streams used as water supplies or in lake water in the vicinity of waterworks intakes.

Excessive prevalence of typhoid fever in any city which, by reason of its commercial or industrial importance, attracts large numbers of visitors has an important bearing upon the spread of typhoid from one State to another.

The same is true of other cities which, because of great natural advantages, the beauty of surroundings, or other reasons, attract thousands of tourists and visitors from other States.

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For these reasons, the prevalence of typhoid fever and the character of the water supplies in cities like Pittsburgh and Detroit, Niagara Falls, or Mackinac Island become a matter of serious moment from an interstate standpoint. The excessive prevalence for years of typhoid fever in Niagara Falls and Pittsburgh was not only a matter of local or even State concern but a grave national danger as well.

The drinking-water tanks of vessels should have no connection with the sea cocks and piping used to draw water for other purposes. It is feasible to use condensed steam for drinking purposes, and, if this system is not installed, vessels should be required to fill their water tanks from municipal supplies which have been certified as safe.

The sources should be certified to by a Federal officer or by a State or municipal officer. If inspection is made by State or municipal officers, they should certify that the source conforms to United States standards.

RECAPITULATION.

To prevent water-borne disease in lake and river traffic, it will be necessary to proceed along the following lines:

1. Popular education is necessary to prevent the drinking of unpurified surface water.

2. Public water supplies in communities engaged in interstate traffic should conform to United States standards.

3. United States standards should be based upon the bacterial count and the quantitative estimation of *B. coli*, and should be the minimum requirements to prevent the spread of disease, such as typhoid fever or Asiatic cholera, in interstate traffic, the various States retaining the right to impose additional requirements, consistent with State laws, when such laws exist.

4. United States regulation is necessary to require vessels engaged in interstate traffic to fill their water tanks with distilled water or from public water supplies certified as safe and conforming to United States standards.

5. Inspection of vessels, by United States officers, and by State and municipal officers duly qualified to enforce this regulation, is necessary.

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[1] Whipple, George C.: Typhoid Fever, p. 179.

[2] Cobb, J. O.: Water contamination aboard ship and its prevention. Journ. Am. Med. Assn., vol. 53, 1909, p. 2057.

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JOINT SESSION OF SECTIONS I AND VIII, FRIDAY AFTERNOON, SEPTEMBER 27, 1912.

BIOLOGIE DE L'ANKYLOSTOMA DUODENALE (DUBINI).

Drs. M. Breton et L. Bruyant, Institut Pasteur de Lille.

Depuis les 30 dernières années, au cours desquelles l'importance de l'ankylostome duodénal en hygiène sociale a été mise en lumière d'une façon éclatante par d'innombrables recherches, la biologie de ce parasite a été remarquablement éclaircie; il semble que peu de chose reste à acquérir sur ce sujet, et que l'avenir n'apportera plus que peu de retouches au tableau du cycle évolutif de l'ankylostome; ce résultat est dû pour la plus grande part aux travaux des zoologistes, parasitologistes et biologistes italiens, français et anglais, parmi lesquelles s'imposent à l'attention les noms de Perroncito, Grassi et Parona, Alessandrini, Lambinet, Malvoz, Manouvriez, Calmette, Boycott et surtout de Looss; les magistrales recherches de ce dernier auteur méritent en effet une mention toute spéciale, et Looss apportait tout dernièrement encore sur la biologie des stades larvaires de l'ankylostome des faits qui resteront définitivement acquis à la science.

La connaissance détaillée de la biologie du parasite est de la plus grande importance en hygiène, parce qu'elle est la base de toute prophylaxie sérieuse de l'ankylostomose; c'est ce que nous espérons faire ressortir de ce travail.

Chargés de résumer ici aussi succinctement et aussi clairement que possible l'état actuel de nos connaissances sur la biologie générale de *l'A. duodenale*, nous croyons utile d'envisager successivement l'œuf, la larve et l'adulte, en retraçant à propos de chacun de ces états successifs du parasite, la physiologie et les réactions vitales de celui-ci aux divers stades de son cycle évolutif. Un paragraphe spécial nous paraît devoir être réservé en terminant pour l'étude des réactions humorales se rattachant à la présence dans l'organisme humain de l'ankylostome adulte, ces réactions n'étant vraisemblablement que la résultante de certaines sécrétions actives de l'helminthe.

Les faits relatés ici s'appiqueront spécialement à *l'A. duodenale*. Les résultats d'assez nombreuses recherches permettent de penser qu'ils sont également vrais pour une autre forme, le *Necator americanus* (Stiles), dont le rôle en hygiène sociale est identique, mais la distribution géographique différente; l'ankylostome duodénal est une espèce européenne disséminée secondairement en Afrique, en Asie et en Amérique; le *Necator americanus* est d'origine asiatique

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et africain, mais implanté secondairement en Amérique. Ces deux formes appartiennent toutes deux à la sous famille de Strongylinæ; la première se place dans le groupe des Strongyleæ, la seconde dans celui des Bunostomeæ (classifications de Railliet).

ÉTUDE DE LA BIOLOGIE DE L'A. DUODENALE (DUBINI).

1. *L'Œuf.*—L'étude des premiers stades évolutifs de l'ankylostome est surtout l'œuvre de Grassi et de Parona, Perroncito, Leichtenstern. L'œuf mesure au moment de la ponte 60 μ sur 40 μ. Sa coque est linéaire, très transparente, cylindrique, arrondie aux deux extrémités. La segmentation a, dans la règle, commencé dans l'utérus, aussi les œufs sont-ils segmentés dans les matières fécales; la présence d'œufs insegmentés est rare et tient peut-être à une ponte prématurée volontaire, se produisant lorsque les femelles se trouvent placées dans des conditions défavorables (Leichtenstern, Looss).

L'œuf se rencontre généralement dans les selles fraîches au stade quatre, plus rarement aux stades deux ou huit; l'embryon prend naissance par des bipartitions successives faciles à suivre, mais au cours desquelles la filiation histogénique des éléments destinés à former les divers organes larvaires est malaisée à interpréter. Quoiqu'il en soit, la segmentation se poursuit avec rapidité dès que les œufs trouvent les conditions d'aération, d'humidité et de température qui leur sont nécessaires. L'embryon ne tarde pas à apparaître sous l'aspect d'un vermicule replié sur lui-même à l'intérieur de la coque; sa formation est complète en 24 heures à la température de 27° C. (Looss). Il présente déjà dans l'œuf des mouvements actifs.

Ce n'est pas toutefois, malgré l'opinion longtemps admise, à ces mouvements qu'il faut attribuer la sortie de l'embryon hors de la coque. Les travaux de Looss ont démontré en effet que l'éclosion est purement passive et que la jeune larve ne joue aucun rôle dans le phénomène; celui-ci paraît être le résultat de simples processus d'osmose amenant l'éclatement de la coque suivi de l'expulsion mécanique de la larve (rôle possible de la membrane vitelline). La larve est mise en liberté dans les matières fécales déposées sur le sol. Nous la laisserons momentanément de côté pour envisager maintenant les conditions influant sur le développement de l'œuf.

La segmentation des œufs exige pour s'effectuer la présence d'oxygène; c'est pour cette raison sans doute que l'évolution embryonnaire est arrêtée dans l'intestin humain et ne se poursuit qu'après l'émission des fèces. Peut-être les gaz intestinaux jouent-ils également un rôle empêchant (Leichtenstern). L'éclosion des œufs ne se produit pas non plus dans une atmosphère de gaz d'éclairage (Calmette et Breton, Lambinet.

L'influence de la température n'est pas moins importante; l'optimum thermique paraît siéger de 25 à 30° C. L'évolution s'arrête

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au-dessus de 37° et au-dessous de 14° C. (de 10 ou 11°, suivant certains auteurs). Une température de 5° C. détruit les œufs au bout de quelques jours; les variations de température lorsqu'elles sont intenses ont les mêmes effets; faibles, elles influencent seulement la rapidité de la segmentation (Lambinet). Ainsi un refroidissement nocturne jusqu'à 2 ou 3° C. est impuissant à tuer les œufs si le réchauffement diurne est suffisant; ces faits expliquent nettement les diverses particularités de l'extension géographique et de l'étiologie de l'ankylostomose.

La rapidité du développement est naturellement en relation directe avec les conditions ambiantes plus ou moines favorables. La segmentation paraît s'effectuer le mieux dans les fèces de consistance demi-molle (Perroncito, Leichtenstern, Lambinet). Elle ne se fait pas dans l'eau pure ni dans les matières étendues. Toutefois la mort des œufs peut se faire attendre dans ces divers milieux jusqu'à neuf jours (Boycott et Haldane) et même 16 jours (Bruns).

L'influence sur le développement des œufs des conditions extérieures en général est depuis longtemps admise, mais l'on doit à Loosé d'avoir attiré l'attention sur un facteur important qui avait passé inaperçu; nous voulons parler des processus de putréfaction. Les recherches de Looss ont prouvé en effet que les phénomènes putréfactifs sont funestes au développement des œufs de l'ankylostome, et que, dans certains cas, l'influence néfaste de certaines conditions extérieures (chaleur, par exemple) n'a d'autre origine que l'apparition des phénomènes putréfactifs dans le milieu ambiant. La quantité d'air nécessaire au développement peut même rester très minime si les phénomènes de putréfaction sont évités.

Les œufs de l'ankylostome duodénal sont excessivement résistants; les sucs gastrique, pancréatique et intestinal restent sans action sur eux; le sublimé à 2 pour cent, le lysol à 3 pour cent, l'hypochlorite de chaux, l'eau de Javel, le formol aux dilutions habituelles n'entravent pas l'éclosion des larves (Lambinet), sans doute par suite des propriétés spéciales de la coque ovulaire et de la membrane vitelline. Le seul résultat que paraisse amener le contact avec les antiseptiques est un léger ralentissement des phénomènes de division cellulaire.

2. *La larve.*—La larve sort de la coque la tête première et se montre sous l'aspect d'un organisme vermiforme de 250 sur 17 μ, obtus en avant et se terminant en arrière par une pointe effilée. Elle présente une cuticule munie de deux ailes latérales, des cellules musculaires en quatre bandes longitudinales; la bouche est terminale, entourée par une lèvre annulaire.

On répète dans tous les ouvrages classiques qu'il s'agit ici d'une larve rhabditoïde; cette assertion n'est pas tout à fait exacte; les trois portions de l'œsophage ne sont pas aussi nettement distinctes que chez les rhabditis véritables, et la séparation entre le premier seg-

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ment œsophagien et le bulbe n'a pas la netteté du type classique (Looss). Le bulbe renferme trois valves œsophagiennes.

L'évolution de la larve d'ankylostome duodénal comprend cinq stades (Looss), dont les deux premiers sont libres et dont les trois derniers se déroulent dans le tube digestif de l'homme. Les stades libres sont faciles à étudier grâce à un procédé imaginé par Looss et devenu rapidement classique, celui de la culture artificielle des larves sur boîtes de Petri au sein d'une pâte à base de charbon animal; la pâte placée à l'étuve présente au bout de quelques jours des fissures où s'accumulent les jeunes vers.

Au premier stade, la larve présente les caractères rappelés ci-dessus et s'accroît rapidement, tout en présentant des mouvements actifs. Les dimensions atteignent bientôt 350 à 380μ (le troisième jour). Alors se produit la première mue, précédée par une sorte de contraction de la larve à l'intérieur de sa cuticule primitive, phénomène surtout bien visible au niveau de l'extrémité céphalique; de la cuticule se détache à la partie antérieure une calotte régulière et la larve abandonne peu à peu la mue qui se fripe, se chiffonne et est finalement abandonnée.

La larve qui a subi sa première mue a sensiblement changé de caractères; la forme des lignes latérales s'est modifiée, et vers le cinquième jour le pharynx subit des remaniements qui l'amènent du type pseudo-rhabitoïde à la forme cylindrique régulière (strongyloïde). En même temps, la structure interne devient plus nette et il apparaît une ébauche des organes génitaux. La longueur de la larve atteint bientôt 500μ et une seconde mue s'effectue.

Concurremment à la transformation de l'œsophage la bouche s'est obturée. La cuticule larvaire paraît de nouveau plus grande que la larve qui se contracte quelque peu et dont l'hypoderme secrète une cuticule de nouvelle formation; mais contrairement à ce qui s'est passé lors de la première mue, l'enveloppe ancienne n'est pas éliminée; loin de là, elle s'imprègne de sels calcaires et devient plus épaisse et plus résistante; la larve peut effectuer à son intérieur quelques mouvements de faible amplitude. On la dit alors au stade d'enkystement et ses dimensions atteignent 500μ de longueur sur 24μ de longueur. Dès ce moment elle ne subit plus guère de modifications jusqu'à son arrivée dans le tube digestif de l'homme. Ses mouvements de progression restent très actifs, mais ils changent de caractères; ils deviennent même plus énergiques et plus rapides ainsi que plus flexueux.

Les réactions vitales de la larve sont différentes suivant que l'on considère le premier ou le second stade (enkystement). Elles méritent donc d'être envisagées séparément.

La larve au premier stade paraît se nourrir des particules les plus ténues des matières fécales et peut-être aussi de quelques substances

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dissoutes. Une nourriture animale paraît nécessaire au développement normal (Looss). Une alimentation insuffisante entraîne un retard ou un arrêt de la croissance.

Comme les œufs, les larves sont très sensibles aux phénomènes de putréfaction et succombent rapidement lorsque ceux-ci se déclarent dans le milieu où elles vivent. Ainsi s'expliquent les bons résultats des cultures sur pâte au charbon, ce dernier corps s'opposant énergiquement aux processus putréfactifs.

Les larves non enkystées supportent très mal l'eau pure; elles vivent bien au contraire dans les eaux boueuses. Elles ont besoin d'oxygène pour se développer et, dans les cultures, gagnent volontiers les parties les plus aérées.

L'optimum de température paraît siéger entre 25 et 30° C. Les larves écloses vers 37° vivent peu, et maintenues d'autre part à 13–14°, elles succombent sans arriver au stade d'enkystement (Lambinet). L'action défavorable des températures un peu élevées pourrait bien n'être due d'ailleurs qu'aux phénomènes de putréfaction concomitants. L'action destructive de la lumière paraît en tous cas n'être qu'une apparence due à la même cause; des expériences minutieuses ont démontré que la lumière solaire même directe ne tue pas les larves si l'on évite l'action de la chaleur et si le milieu ne fermente pas (Looss); la lumière diffuse se montre absolument inoffensive.

Les larves à l'état d'enkystement ne prennent plus de nourriture; elles présentent une résistance plus grande encore que celle des larves au premier stade, ce qu'explique aisément la présence de l'enveloppe protectrice. Les larves mûres résistent pendant 15 jours à une température de 11 à 15° C., et pendant quatre à cinq jours à 5–7° C.; une congélation temporaire peut même être subie sans dommage (Looss).

La pauvreté du milieu en oxygène est mieux supportée par les larves mûres que par les larves jeunes et les premières vivent facilement dans l'eau pure pendant trois ou quatre mois. Elles préfèrent toutefois les eaux boueuses, qu'elles abandonnent même volontiers pour se répandre dans l'enduit gluant qui recouvre les boisages des mines et les parois des galeries, venant ainsi se mettre à la hauteur des ouvriers (Tenholt). Leur vie peut se prolonger dans ce milieu des mois et même une année (Boycott).

La faculté de résistance à la dessiccation des larves mûres a fait l'objet de nombreuses controverses. On voit de suite l'importance considérable que pouvait présenter un pareil fait reconnu exact au point de vue de l'expansion de l'ankylostomose. Admise par Perroncito qui croyait que les larves enkystées supportaient une dessiccation d'une durée inférieure à 48 heures, la résistance à la dessiccation a été niée par Leichtenstern, Liefman, Lambinet, Alessandrini, Smith, et définitivement infirmée par les expériences de Looss. La dessic-

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cation tue en effet immédiatement les larves même enkystées, et la prétendue reviviscence de ces larves réhumectées doit être reléguée au rang des erreurs d'observation.

L'action sur les larves des substances chimiques a fait l'objet de nombreuses recherches de Perroncito, Lagage, Malvos, Bruns, Herman, Lambinet, Breton, qui espéraient tirer de leurs expériences des indications pratiques en vue de la désinfection des mines. Les résultate obtenus ont été les suivants: le sublimé à 2 pour cent, l'acide sulfurique à 2 pour cent, l'acide nitrique à 10 pour cent, l'acide picrique à 5 pour cent, sont impuissants à arrêter les mouvements des larves en 15 minutes; il en est de même du formol du commerce à 10 pour cent. Avec l'alcool absolu, la lessive de potasse à 30 pour cent, cinq minutes sont nécessaires pour immobiliser les larves. Seul le chloroforme exerce une action immédiate (Herman). D'aprés Lambinet, le sublimé à 2 pour cent n'arrête les mouvements qu'au bout de six heures, le phénosalyl à 3 pour cent au bout de 1 heure ½ à 2 heures, l'acide sulfurique à 50 pour cent après 45 minutes. Le carbonate de soude, l'eau de Javel, la liqueur de Labarraque, l'ammoniaque à des concentrations suffisantes exigent de une demi-heure à plusieurs heures pour exercer leur action destructive. Le lysol et le sulfate de fer à saturation ne sont pas plus efficaces (Breton) et les antiseptiques volatils n'ont pas une action plus rapide. Cependant, d'après Calmette et Breton, l'action de saupoudrer les milieux de Looss avec un mélange de sulfate ferrique et de chaux empêche radicalement l'éclosion des larves.

L'une des substances les plus actives contre ces dernières serait le chlorure de sodium qui, en solution à 2 pour cent, les tuerait dans l'espace de quelques minutes (Boycott et Haldane). Cette influence du sel paraît être digne de considération et l'on a signalé des mines de houille qui ne devaient leur immunité vis à vis de l'ankylostomose que grâce à la présence d'eaux salées d'infiltration (Manouvriez). Les eaux naturellement acides de certaines mines autrichiennes ont la même action (R. Blanchard). Toutefois Calmette, François et Breton, tout en reconnaissant l'efficacité du sel pensent que les proportions indiquées par Boycott et Haldane sont insuffisantes pour la destruction des larves, et d'autre part la salaison des eaux de mines est peu réalisable en pratique.

En somme, on voit que la grande résistance des larves aux agents chimiques rend illusoires les essais de désinfection des mines proposés pour juguler l'ankylostomose; aucun antiseptique ne semble, en effet, pratiquement utilisable. Ce fait trouve son explication dans les propriétés spéciales de la cuticule larvaire.

3. *Passage de la vie libre à la vie parasitaire.*—Les larves enkystées sont capables, comme on l'a vu, d'attendre plusieurs mois et même peut-être une année, leur passage dans le tube digestif de l'homme.

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On a longtemps admis que la pénétration de l'ankylostome duodénal dans l'organisme humain s'effectuait exclusivement par voie digestive. De fait, les larves enkystées offrent une résistance remarquable vis à vîs du suc gastrique; l'action de ce dernier se borne à ramollier et à dilater l'enveloppe kystique, et la larve profite de la modification de consistance de celle-ci pour s'en échapper. La sortie des jeunes vers peut être réalisée artificiellement sans l'aide du suc gastrique si l'on mélange des liquides larvifères à de la gélatine; l'adhérence de cette dernière à l'enveloppe kystique en favorise la déchirure et par suite l'issue des larves.

L'addition au suc gastrique d'acides organiques (citrique ou tartrique à 1 pour cent) ne modifie pas son action sur les larves malgré les affirmations de Goldman qui avait cru trouver dans l'ingestion habituelle de limonades acides un moyen préservateur contre l'infection digestive.

Les sucs pancréatique et intestinal n'ont pas plus d'action que le suc gastrique. Enfin les expériences de Breton qui a introduit dans le péritoine de divers animaux des tubes capillaires remplis de larves vivantes, ont démontré que la phagocytose ne s'exerce pas sur celles-ci.

Des essais d'infection par voie digestive ont été effectués avec succès par de nombreux auteurs depuis Perroncito, et ce mode d'invasion de l'organisme garde son importance au moins dans certains cas. Les larves enkystées qui vivent dans les eaux stagnantes et boueuses des mines sont aisément amenées jusqu'à la bouche des ouvriers par l'intermédiaire des mains souillées. Leur ascension sur les enduits qui recouvrent les bois de soutènement et les parois des galeries n'est pas sans favoriser ce mode de contage. Le rôle des aliments souillés peut ne pas être non plus négligeable, mais le contact des mains ou des aliments avec des substances larvifères est toujours nécessaire pour la contamination, car la dissémination des larves par le vent avec les poussières est rendue invraisemblable du fait de leur sensibilité à la dessiccation. Quant au rôle des mouches admis par Alessandrini pour le transport des larves, il doit être au moins exceptionnel.

A côté de l'infection par voie digestive, il existe un autre mode de contamination, d'importance probablement supérieure; c'est la pénétration cutanée des larves, admise pour la première fois par Looss en 1898. Les assertions de ce dernier auteur ont suscité de tous côtés des expériences fort nombreuses qui sont venues confirmer pleinement la réalité de la pénétration larvaire par les téguments de l'homme. Ce n'est pas ici le lieu de rappeler tous ces essais, effectués tant chez l'homme que chez les animaux avec les larves de l'*Ankylostoma duodenale*, de l'*A. caninum* et du *Necator americanus*. La pénétration active de ces nématodes larvaires à travers la peau est aujourd'hui universellement admise (Looss, Smith, Sandwitch,

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Schaudinn, Tenholt, Liefmann, Boycott, Bruns et Müller, Lambinet, Calmette et Breton).

La larve enkystée de l'ankylostome duodénal est animée d'un mouvement spécial qui la porte à pénétrer, d'une façon pour ainsi dire automatique, dans les fissures qu'elle rencontre. Ce fait particulier explique la facile introduction du parasite dans les téguments humains ou animaux, introduction qui a pu être suivie dans toutes ses phases par de nombreux observateurs. L'abandon de l'enveloppe kystique se produit ici au cours même de la pénétration et d'une façon toute mécanique, et comme pour les larves incorporées à la gélatine, la rupture de l'enveloppe est due vraisemblablement aux frottements de celle-ci contre les parois du pertuis ou de la fissure qui permettent l'intrusion des larves.

L'entrée par les follicules pileux a été tout d'abord observée (Looss, Herman) et l'on a cru quelque temps que tel était l'unique mécanisme de la pénétration. Il n'en est rien toutefois et la migration larvaire peut s'effectuer à la faveur de toutes les fissures cutanées, quelles qu'elles soient (solutions traumatiques de continuité de l'épiderme, fissures par détachement de squames cornées).

Cette migration cutanée a permis d'expliquer très naturellement divers phénomènes pathologiques notés depuis longtemps déjà chez les individus exposés à la contamination: éruptions tégumentaires prurigineuses, papuleuses et pustuleuses, siégeant aux endroits découverts ou aux plis de flexion, et désignés sous les noms de gourme des mineurs, ground ditch, urticaire tubéreux, panighas, mazzamora. Ces dermatoses sont occasionnées par le passage même des larves au travers de la peau, et l'on sait que c'est la production de phénomènes prurigineux qui attira la première fois l'attention de Looss, dans une observation auto-personnelle, sur la possibilité de l'infestation par voie cutanée.

La pénétration n'exige pas plus de quelques minutes (quatre minutes pour *Necator americanus* d'après Smith). Cette rapidité de la migration démontre combien sont grandes les chances d'infection, même lorsque le contact de la peau avec des substances souillées n'est que tout à fait momentané. On a noté au niveau des points d'entrée des parasites une forte éosinophilie locale.

L'enveloppe kystique quittée par la larve est abandonnée à la surface de la peau du sujet infecté. L'âge n'est pas toujours un facteur indifférent dans la facilité plus ou moins grande de la migration; des expériences ont prouvé que celle-ci était plus aisée chez les animaux jeunes dont les téguments sont moins résistants; ceci toutefois est vrai surtout pour certains animaux tels que le chien, et la question d'âge ne paraît pas avoir une très grande importance dans l'espèce humaine.

La durée minima qui s'écoule entre l'introduction des larves et la première apparition des œufs dans les fèces paraît être de 45 jours

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(Looss). Elle n'est que de 30 jours par voie buccale. Des téguments au tube digestif la voie empruntée est la suivante:

Des follicules pileux ou des fissures accidentelles de l'épiderme, les larves pénètrent dans les lymphatiques au moins aussi souvent, semble-t-il, que dans les vaisseaux sanguins. Entraînées par la lymphe, elles parviennent dans les ganglions, au niveau desquels un certain nombre d'entre elles sont détruites par phagocytose. Celles qui résistent sont amenées par le canal thoracique jusque dans le cœur droit, où leur présence a pu être démontrée expérimentalement chez l'animal. Celles qui ont emprunté la voie sanguine gagnent-elles aussi le cœur droit par le système veineux et, avec les premières, elles sont lancées dans la circulation pulmonaire. Arrêtées par leurs dimensions considérables qui leur interdisent l'accès des capillaires du poumon, elles traversent par effraction les parois vasculaires et tombent dans les alvéoles. Ce passage actif des vaisseaux dans les cavités alvéolaires détermine sur les poumons examinés dans les autopsies un piqueté hémorragique particulier; il explique l'existence chez les individus en voie d'infestation des symptômes bronchiques décrits depuis longtemps sous le nom de catarrhe des gourmes (Manouvriez), à cause de leur coïncidence régulière avec les éruptions cutanées signalées plus haut.

Des alvéoles pulmonaires, les larves sont amenées avec les mucosités jusque dans les bronches, puis dans la trachée; arrivées au niveau du pharynx elles sont entraînées dans l'œsophage, puis dans l'estomac par les mouvements de déglutition. Comme elles résistent parfaitement aux sucs digestifs, elles parviennent enfin dans l'intestin, où les derniers stades de leur cycle évolutif vont se dérouler.

On s'est demandé si un certain nombre d'entre elles, au lieu de suivre la voie régulière ci-dessus, n'empruntent pas pour gagner l'intestin, un autre chemin et si, en particulier, quelques-unes ne gagneraient pas la cavité générale du corps pour pénétrer directement de la séreuse péritonéale dans le tube digestif.

Cette hypothèse ne paraît pas pouvoir être acceptée à la suite de recherches expérimentales. On rencontre parfois enfin en divers points de l'organisme des larves égarées dont la destinée ultérieure n'est pas bien connue, mais elles sont vraisemblablement vouées à la destruction.

Quelques auteurs admettent encore, outre les deux modes précédents d'infection, une pénétration des larves par les voies respiratoires. Des expériences ont prouvé en fait que des plaques de verre humectées suspendues dans des galeries très infectées pouvaient au bout d'un certain temps présenter à leur surface quelques larves apportées par l'air; il n'est donc pas inadmissible que l'homme puisse parfois se contaminer en respirant un air chargé de parasites (Schopf), mais ce mode d'infection ne peut être que tout à fait exceptionnel.

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Quelle que soit la voie d'introduction dans l'organisme des larves de l'ankylostome duodénal, c'est dans la première partie de l'intestin que se déroulent les troisième, quatrième et cinquième stades larvaires qui précèdent l'apparition de l'état adulte.

Il se dessine tout d'abord au niveau de l'extrémité céphalique du jeune helminthe une capsule buccale provisoire, permettant déjà la fixation à la muqueuse et dont les dimensions s'accroissent rapidement; un nouvel orifice buccal se forme garni de papilles; du troisième au septième jour, une mue s'effectue et la larve passe au quatrième stade.

Elle est pourvue à ce moment d'une capsule buccale en entonnoir munie de deux paires de dents; cette capsule présente déjà l'orientation vers la face dorsale qui caractérisera la capsule définitive de l'adulte; cette dernière se différencie, avec ses lames et ses crochets, non pas aux dépens de la capsule provisoire mais au-dessous de celle-ci, avant le quatorzième jour. A cette date, une quatrième mue se produit; le ver qui apparaît offre à peu près tous les caractères de l'adulte à la grandeur près (5e stade). Il a 2 mm. 5 de longueur sur 120 à 140 μ de largeur. L'état adulte proprement dit paraît réalisé et l'accouplement possible au bout de quatre semaines.

4. *Adulte.*—L'ankylostome adulte se fixe dans le duodénum de l'homme; c'est à tort qu'on l'a cru capable de parasiter le chien et même le cheval; il paraît en effet vivre exclusivement chez l'homme et chez quelques singes anthropoïdes (*Gorilla gorilla, Hylobates lar*). Cependant on obtiendrait un développement partiel de se ver dans le tube digestif de jeunes chiens (Looss).

Le parasite est rare au delà du duodénum (Lortet), bien qu'on ait pu le rencontrer accidentellement sur toute la longueur de l'intestin grêle. Son adhérence à la muqueuse intestinale est intense; il se rompt plutôt que de se laisser détacher. Cette adhérence est obtenue par un phénomène de succion; la dilatation du pharynx détermine un vide partiel dans la capsule buccale; un point de la muqueuse est aspiré et fait saillie; les crochets capsulaires l'immobilisent dès lors dans cette position.

L'accouplement qui dure probablement plusieurs jours est favorisé par la présence chez le mâle d'une bourse copulatrice qui se fixe solidement, au niveau de la vulve, sur le corps de la femelle. Les deux individus prennent alors l'aspect d'un Y dont l'une des branches de bifurcation est représentée par le mâle, l'autre branche et le pied par la femelle.

L'ankylostome duodénal n'est pas toujours simplement appendu à la muqueuse intestinale; il peut dans quelques cas se rencontrer dans des cavités remplies de sang de dimensions variables et situées dans la muqueuse elle-même; il ne s'agit pas là, ainsi qu'on a pu le croire, de vers arrivés à l'intestin par la cavité péritonéale, mais bien de

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vers situés primitivement dans le tube digestif et qui se sont enfoncés secondairement dans la muqueuse.

La fixation des ankylostomes sur la paroi intestinale détermine de petites plaies de la dimension d'une tête d'épingle, entourées d'une zône ecchymotique rougeâtre. Ces lésions intéressent le duodénum et parfois la première partie de l'iléon. Outre les hémorragies auxquelles elles donnent lieu, il est probable qu'elles peuvent favoriser dans certains cas l'introduction dans la circulation de germes pathogènes; l'ankylostome aurait donc indirectement un rôle infectieux, ainsi qu'il semble prouvé déjà pour de nombreux helminthes (Weinberg) et favoriserait parfois l'apparition d'infections générales graves et même de septicémies (Brimont, Sabrazès).

Les ankylostomes adultes eux-mêmes exercent sur les individus qui les hébergent des actions nocives multiples, spoliatrices, traumatiques et surtout toxiques.

On a cru longtemps que les symptômes graves de l'ankylostomose résulteraient de la spoliation sanguine exercée par les helminthes et les ankylostomes ont été jusque dans ces derniers temps considérés comme des vers essentiellement hématophages. Or les dernières recherches effectuées dans ce sens ont considérablement modifié les idées admises jusqu'ici.

Les pertes sanguines au niveau des lésions déterminées par les crochets buccaux de l'ankylostome ne sont assurément pas négligeables et l'on a vu que l'on rencontrait parfois des vers immergés au sein même de petites cavités hématiques. Toutefois, il est aujourd'hui prouvé que l'ankylostome se nourrit non pas de globules sanguins, mais des cellules épithéliales de la muqueuse qu'il broute grâce à son armature buccale.

Les coupes effectuées par Igaravidez sur *Necator americanus* démontrent que ce nématode ne lèse que la couche épithéliale de la muqueuse, quoique la sous-muqueuse soit elle aussi entraînée par succion à l'intérieur de la capsule. Au point de fixation de l'helminthe, la sous-muqueuse se montre complètement dénuée d'épithélium. L'intestin du parasite renferme de nombreuses cellules épithéliales et pas de globules sanguins. Or les recherches de Looss chez, l'ankylostome duodénal ont fourni des résultats absolument identiques.

Les travaux de Brumpt sur divers ankylostomes des animaux ont permis de tirer les mêmes conclusions et de les étendre même à d'autres helminthes considérés primitivement comme hématophages et qui, en réalité, ne se nourrissent que de cellules épithéliales, de contenu intestinal et même d'infusoires parasites. On peut ajouter enfin que la couleur de l'ankylostome duodénal est gris-blanchâtre et non rouge, ainsi qu'on l'admettait auparavant comme conséquence de son régime alimentaire.

Si l'ankylostome ne se nourrit pas de globules sanguins, le rôle des hémorragies produites au niveau des lésions de la muqueuse ne

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doit pas être négligeable, car l'écoulment sanguin peut être continu et l'afflux du sang favorisé par la sécrétion d'une salive irritante et de substances anticoagulantes, mais bien plus important semble dans l'étiologie des symptômes le rôle des toxines vermineuses.

L'ankylostome adulte est pourvu en effet de glandes secrétant des liquides actifs; ce sont les glandes céphaliques formées chacune d'une volumineuse cellule et dont les canaux excréteurs débouchent dans la capsule. Véritables glandes salivaires, elles fournissent une sécrétion irritante et toxique. En outre, deux glandes cervicales aboutissant à un pore excréteur ventral un peu au-dessous de la tête (Alessandrini) paraissent fournir un liquide jouissant de propriétés hémolytiques. Ceci nous amène à résumer succinctement la question des réactions humorales chez les ankylostomosés.

5. *Réactions humorales dans l'ankylostomose.*—La sécrétion de substances toxiques par les vers est suffisante à elle seule pour expliquer, en dehors de toute action spoliatrice les symptômes de l'anémie vermineuse. Lussana avait montré déjà en 1890 que les urines d'un malade anémique produisaient chez le lapin de la destruction globulaire, tandis que les urines du même sujet se montraient inactives après l'expulsion des helminthes. Loeb en 1904, extrait de la partie antérieure des vers contenant les glandes céphaliques et cervicales, une substance empêchant la coagulation du sang. Cette découverte est confirmée par Alessandrini qui émet en outre l'hypothèse que les glandes cervicales émettent une toxine hémolytique.

Les assertions de Lussana ont été confirmées par Bohland, et Calmette et Breton ont montré que l'existence de substances dissolvant les hématies n'est pas le seul apanage de la partie antérieure des vers mais qu'elle est marquée également pour la partie postérieure. Il n'en reste pas moins établi que les glandes de la partie antérieure ont sur le sang humain, *in vitro*, une action hémolysante énergique (Alessandrini, Preti, Whipple).

L'hémolysine est insoluble dans l'eau salée, soluble dans l'alcool et dans l'éther, thermostabile. La lécithine augmente son pouvoir hémolysant sans former de lécithides (Luigi Preti). La cholestérine ne la neutralise pas; soumise à la digestion tryptique, elle devient soluble dans l'eau; l'extrait alcoolique d'ankylostome ne possède ni propriétés tryptiques ni propriétés antitryptiques. L'hémolysine appartiendrait au groupe des lipoïdes.

Son action hémolytique s'exerce dans l'économie des sujets atteints d'ankylostomose; le nombre des globules rouges est fortement diminué et ces globules présentent des lésions manifestes.

Le sérum même des individus anémiques jouirait de propriétés hémolytiques vis à vis des globules normaux (Noc); cette activité du sérum se maintient après un chauffage prolongé à 58–60°. D'après quelques auteurs le chauffage se montrerait même favorisant en

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détruisant des substances capables de juguler l'action des hémolysines (Dante de Blasi). Sicardi qui ne partage pas tout à fait l'opinion des autres expérimentateurs sur l'action hémolytique des sérums des malades, reconnaît que les hématies des ankylostomosés présentent une fragilité plus grande que normalement.

L'existence d'une substance anticoagulante dans l'extrémité céphalique de l'ankylostome duodénal est bien établie aujourd'hui (Loeb et Smith). Cette substance est thermostabile mais sensiblement affaiblie par le chauffage, très résistante à la dessiccation, non identique à l'hirudine mais plus voisine de l'anticoaguline du venin de cobra (Loeb et Fleisher). Noc a démontré de même, chez *Necator americanus*, la présence d'une substance empêchant la coagulation du sang de l'homme et activant celle du sang de Macaque. Une dose moyenne retarde la coagulation du sang normal, puis provoque la décoagulation et l'hémolyse; une dose plus forte accélère la coagulation tout en gardant son activité décoagulante et hémolytique. Il s'agit donc d'une action très complexe.

On a admis la présence dans les extraits d'ankylostomes, d'hémotoxines (Preti), analogues à celles secrétées par certains sclérostomes des equidés Weinberg et Léger). Les effets de ces toxines sur l'organisme des malades se traduirait par des symptômes rappelant ceux du béri-béri, que Noc rapporte à une infection par le *Necator americanus*.

Le taux de l'hémoglobine est diminué au cours de l'ankylostomose. Quant à l'éosinophilie elle constitue un symptôme constant bien que d'intensité variable. Elle n'est pas toujours en rapport avec le nombre des parasites et paraît dépendre de conditions purement individuelles. Très marquée au début de la maladie (elle peut atteindre 72 pour cent d'après Ehrlich et Leichtenstern), elle peut diminuer considérablement dans les cas d'infection ancienne (Boycott, Hocart Brékant). Son apparition doit être en tous cas fort rapide car Boycott a noté de l'éosinophilie manifeste au vingt-septième jour après une infestation cutanée et au cinquante-deuxième jour la proportion d'éosinophiles était de 44 pour cent.

Les essais de séro-diagnostic par agglutination des larves dans l'ankylostomose sont restés complètement négatifs (Herman). L'insuccès est peut-être dû à la présence de l'enveloppe kystique. Enfin la réaction à la meiostagmine a été trouvée positive chez des porteurs d'ankylostomes (Izar, Ascoli), mais cette réaction n'est pas spécifique de l'anémie vermineuse.

Conclusions.—La connaissance du cycle évolutif de l'ankylostome duodénal n'est pas seulement utile au parasitologiste et au médecin; elle est de première importance pour l'hygiéniste.

La résistance toute spéciale des œufs et des larves rend illusoires tous les procédés préconisés pour la désinfection des puits de mines. Tout au plus certaines conditions naturelles de salure des eaux d'infil-

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tration peuvent-elles jouer un rôle dans la préservation de certaines fosses (Manouvriez, Boycott).

La prophylaxie de l'ankylostomose doit tendre principalement à empêcher l'introduction des jeunes helminthes dans l'organisme humain, et tirer ses principes de la connaissance de la contamination par voie buccale et surtout par voie cutanée. C'est le contact des téguments avec des objets souillés de boues larvifères qui doit avant tout être évité si l'on veut supprimer toute chance d'infection au niveau de la peau; l'infection buccale sera du même fait rendue impossible puisque les larves ne sont amenées à la bouche, au moins dans l'immense majorité des cas, que par l'intermédiaire des mains souillées des ouvriers.

La préservation des puits contre la pullulation des ankylostomes impose l'interdiction des mines à tous les individus contaminés, l'assèchement relatif des galeries, la défense d'y déposer les matières fécales, le traitement de tous les sujets atteints.

Si les recherches les plus récentes sur la biologie de l'ankylostome ont modifié les idées régnantes sur le rôle pathogène de cet helminthe et montré que ce rôle était moins spoliateur que toxique, elles n'ont pas diminué l'importance de la lutte contre l'ankylostomose. Celle-ci sera poursuivie victorieusement dans l'avenir grâce aux résultats fournis par les travaux persévérants des savants italiens, français et anglais qui se sont attachés à la solution de cette intéressante question d'hygiène sociale.

NUMBER OF TREATMENTS AND NUMBER OF FULL DOSES OF THYMOL ADMINISTERED IN 61 HOSPITAL AND 22 HOME CURED CASES OF HOOKWORM INFECTION.

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The term "cured," in this paper, means that a week or more after treatment a microscopic reexamination of the patient gave negative results.

In practical hookworm-eradication work the question is frequently asked, How long does it take to cure a case? This question has a practical basis from the standpoint of the patients, for many of them refuse to take a second course of medication. From the standpoint of the person giving the treatment, the question has a double significance: (1) The greater the number of patients who can be cured in a single treatment, the more rapidly will a certain—and a very important—part of the work be finished. (2) Many patients are, however, very ignorant and can not be relied upon, as experience shows, to carry out directions; accordingly, the clinician has his choice between (*a*) assuming a certain amount of risk by giving a larger dose, and (*b*) giving repeated treatments with smaller doses, thus giving to himself and to the patient a greater amount of trouble, but

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at the same time increasing the factor of safety for his patient; running the risk, however, that his patient will not return for more than one treatment and therefore possibly leaving one more uncured case at large to infect other people.

There are known to us not less than 11 deaths in this country, due, so far as it has been possible to determine, either to following thymol with castor oil instead of with salts, or to carelessness in respect to following out the usually adopted procedure. But whatever the explanation of these deaths may be, the fact remains that many patients whom we treat are exceedingly ignorant and illiterate and are unreliable when it comes to following out instructions.

It is therefore more than an academic matter to determine how small a dose can or does cure a case of hookworm infection, and the extent of the infection in question.

The present paper contains two series of cases, one series treated in the hospital, the other at home.

In a certain cotton-mill village in eastern North Carolina, 267 inhabitants (140 males, 127 females) out of a population of 700 volunteered for microscopic examination. Thus 38.1 per cent of the population volunteered.

Of these 267 (white) inhabitants, 140 persons (or 52.4 per cent) were found infected with hookworms.

Of 140 males, 79 persons (or 56.4 per cent), and of 127 females, 61 persons (or 48 per cent) showed hookworm infection.

Most of the patients mentioned in this paper came from the cotton mill in question.

Number of treatments of females.—A number of the females were treated at their homes, with a mill nurse to visit them during the day of medication. In some instances it was impossible to obtain specimens to determine whether or not the treatment was complete in results, but the following data may be reported:

Total number of females examined, 127.

Total number of females found infected, 61 persons, or 48 per cent.

Total number of females treated, 52; cured, 19; data incomplete, 33; not treated, 9.

Treated one or more times, 52; cured in one treatment, 12; not cured in one treatment, 21; data incomplete in 19.

Treated two or more times, 21; cured in two treatments, 7; not cured in two treatments, 5; data incomplete in 9.

Treated three or more times, 5; cured in three treatments, (?); not cured in three treatments, 1; data incomplete in 4.

Treated four times, 1; cured in four treatments, (?); not cured in four treatments, (?); data incomplete, 1.

Number of treatments of males.—The following tabulation gives the male cases treated at the hospital and also, in brackets, male cases treated at home:

Treated one or more times, 94 [+9]; cured in one treatment, 45 [+3]; not cured in one treatment, 15 [+1]; data incomplete in 34 [+5].

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Treated two or more times, 29 [+1]; cured in two treatments, 6; not cured in two treatments, 14 [+1]; data incomplete in 9.

Treated three or more times, 14 [+1]; cured in three treatments, 6; not cured in three treatments, 6 [+1]; data incomplete in 2.

Treated four or more times, 6 [+1]; cured in four treatments, 1; not cured in four treatments, 5 [+1].

Treated five or more times, 5 [+1]; cured in five treatments, 1; not cured in five treatments, 3 [+1]; data incomplete in 1.

Treated six or more times, 3 [+1]; cured in six treatments, 0; not cured in six treatments, 2 [+1]; data incomplete in 1.

Treated seven or more times, 2 [+1]; cured in seven treatments, 2; not cured in seven treatments, [1].

Comparing the male hospital cases with the male home cases and the female (home) cases, it is clear that a greater proportion (45 in 94 = 47.8 per cent) of cures on one treatment are known for the hospital than for the home cases (15 in 61 = 24.5 per cent). That this result is not due entirely to incomplete data is rendered probable by two facts: (1) That there is a smaller number of known incomplete cures in 1 treatment (15 in 94 = 15.9 per cent) for the hospital than for the home cases (22 in 61 = 36 per cent), and (2) in leaving thymol at the home the tendency is to leave smaller doses so as to increase the factor of safety to the patient, in view of the risks necessarily connected with leaving the drug among people who can not be relied upon to carry out directions—even when printed directions are given. In other words, a larger dose of thymol given under hospital conditions involves less of a risk to a patient in a given physical condition than it does to the same patient at home, and we are fully justified in giving larger doses in hospital practice.

Total size of dose used.—Tabulation of the cured cases in question, according to the total amount of thymol used per age of patient, gives the following results:

Tabulation of 19 cured female cases treated at home.

Age.	Number.	Basic maximum single dose of thymol.	First dose.	Second dose.	Total grains of thymol.	Portion of single basic maximum dose for age.
		Grains.				
7½ years	1	15	5	5	10	0.66
12 years	1	30	10	.....	10	.33
12½ years	1	30	12½	?.....	12.5	.41
13 years	1	30	15	.....	15	.50
15 years	2	45	20	.....	20	.44
16 years	1	45	12½	12½	25	.55
Do	1	45	30	30	60	1.33
17 years	1	45	25	.....	25	.55
18 years	1	45	40	.....	40	.88
Do	1	45	35	35	70	1.55
19 years	1	45	35	.....	35	.77
20 years	1	60	35	.....	35	.58
21 years	1	60	40	40	80	1.33
22 years	1	60	50	.....	50	.83
23 years	1	60	40	40	80	1.33
26 years	1	60	45	45	90	1.50
28 years	1	60	30	.....	30	.50
45 years	1	60	30	.....	30	.50
Total	19	825	.....	.....	717.5	.87

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From the foregoing tabulation it is seen that of 19 complete cures in home treatment, 12 had only one treatment, and 7 had two treatments each, 14 were cured with less than a full dose of thymol, and 5 had above one full dose, but not over 1½ full doses.

Illustrating the possibilities of accident, even when the patients are cautioned as to details, it may be stated that a few moments after one of the children took her thymol some kind neighbor, learning that the child had had no breakfast, attempted to give the patient some wine. It was only by a mere chance that the good intentions of the kind neighbor were frustrated, and thereby that probable accident was averted.

Although it was not feasible to draw a comparison in these cases between the size of the dose and the number of worms passed, the table shows that some cases may be cured at home in one course of treatment with as even as low as one-third of the present standard dose.

Tabulation of 3 cured male cases treated at home.

Age.	Number.	Basic maximum single dose of thymol.	First dose.	Total grains of thymol.	Portion of single maximum dose.
		Grains.			
5 years	1	15	3	3	0.2
6 years	1	15	5	5	.33
7 years	1	15	7½	7½	.5
Total	3	45	15½	15½	.34

In case of these children it was distinctly unwise to give the maximum dose for the age group, and all three were cured with half a dose or less. In one other case, seven home doses (small) failed to effect a complete cure.

It was not feasible to count the worms in these cases.

Tabulation of 61 cured hospital male cases, arranged according to age and dose.

Age.	Number.	Basic maximum dose.	First dose.	Second dose.	Third dose.	Fourth dose.	Fifth dose.	Sixth dose.	Seventh dose.	Total thymol.	Portion of single maximum dose.	Worms collected.
										Grains.		
5 years	1	15	7.5	.....	.....	.....	.....	.....	.....	7.5	0.5	1
Do	1	15	10	10	.....	.....	.....	.....	.....	20	1.33	14
6 years	1	15	7.5	10	10	.....	.....	.....	.....	27.5	1.83	62
7 years	1	15	15	.....	.....	.....	.....	.....	.....	15	1	2
Do	1	15	15	.....	.....	.....	.....	.....	.....	15	1	5
8 years	1	15	10	.....	.....	.....	.....	.....	.....	10	.66	42
9 years	1	15	20	.....	.....	.....	.....	.....	.....	20	1.33	2
Do	1	15	20	.....	.....	.....	.....	.....	.....	20	1.33	3
Do	1	15	20	.....	.....	.....	.....	.....	.....	20	1.33	7
10 years	1	30	15	.....	.....	.....	.....	.....	.....	15	.5	0
Do	1	30	20	.....	.....	.....	.....	.....	.....	20	.66	1
Do	1	30	20	.....	.....	.....	.....	.....	.....	20	.66	19
Do	1	30	20	20	20	.....	.....	.....	.....	60	2	474
Do	1	30	12	15	12.5	15	20	.....	.....	74.5	2.48	295

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Tabulation of 61 cured hospital male cases, arranged according to age and dose—Contd.

Age.	Number.	Basic maximum dose.	First dose.	Second dose.	Third dose.	Fourth dose.	Fifth dose.	Sixth dose.	Seventh dose.	Total thymol.	Portion of single maximum dose.	Worms collected.
										Grains.		
11 years	1	30	15	.....	.....	.....	.....	.....	.....	15	.5	2
Do.	1	30	25	.....	.....	.....	.....	.....	.....	25	.83	2
Do.	1	30	25	.....	.....	.....	.....	.....	.....	25	.83	4
12 years	1	30	25	.....	.....	.....	.....	.....	.....	25	.83	21
Do.	1	30	25	.....	.....	.....	.....	.....	.....	25	.83	6
Do.	1	30	30	.....	.....	.....	.....	.....	.....	30	1	7
Do.	1	30	10	10	20	.....	.....	.....	.....	40	1.33	113
Do.	1	30	20	20	.....	.....	.....	.....	.....	40	1.33	68
Do.	1	30	20	20	20	25	25	25	25	160	5.33	506
13 years	1	30	20	.....	.....	.....	.....	.....	.....	20	.66	138
Do	1	30	25	.....	.....	.....	.....	.....	.....	25	.83	1
Do.	1	30	25	.....	.....	.....	.....	.....	.....	25	.83	1
Do.	1	30	20	25	.....	.....	.....	.....	.....	45	1.5	111
Do.	1	30	20	20	30	.....	.....	.....	.....	70	2.33	170
14 years	1	30	20	.....	.....	.....	.....	.....	.....	20	.66	150
Do.	1	30	25	.....	.....	.....	.....	.....	.....	25	.83	0
Do.	1	30	25	.....	.....	.....	.....	.....	.....	25	.83	9
Do.	1	30	30	.....	.....	.....	.....	.....	.....	30	1	4
Do.	1	30	30	.....	.....	.....	.....	.....	.....	30	1	7
Do.	1	30	20	20	25	.....	.....	.....	.....	65	2.16	72
15 years	1	45	25	25	.....	.....	.....	.....	.....	50	1.11	1,142
16 years	1	45	20	.....	.....	.....	.....	.....	.....	20	.44	73
Do.	1	45	30	.....	.....	.....	.....	.....	.....	30	.66	3
Do.	1	45	20	25	30	.....	.....	.....	.....	75	2.33	538
Do.	1	45	10	15	25	15	25	30	30	150	3.33	633
17 years	1	45	25	25	25	25	.....	.....	.....	100	2.22	2,277
18 years	1	45	45	.....	.....	.....	.....	.....	.....	45	1	(?)
Do.	1	45	50	50	.....	.....	.....	.....	.....	100	2.22	92
19 years	1	45	45	.....	.....	.....	.....	.....	.....	45	1	37
20 years	1	60	45	.....	.....	.....	.....	.....	.....	45	.75	11
Do.	1	60	45	.....	.....	.....	.....	.....	.....	45	.75	72
Do.	1	60	50	.....	.....	.....	.....	.....	.....	50	.83	7
21 years	1	60	60	.....	.....	.....	.....	.....	.....	60	1	95
Do.	1	60	60	.....	.....	.....	.....	.....	.....	60	1	143
23 years	1	60	60	.....	.....	.....	.....	.....	.....	60	1	167
24 years	1	60	60	.....	.....	.....	.....	.....	.....	60	1	24
25 years	1	60	45	.....	.....	.....	.....	.....	.....	45	.75	44
26 years	1	60	42.5	.....	.....	.....	.....	.....	.....	42.5	.70	6
27 years	1	60	60	60	.....	.....	.....	.....	.....	120	2	1
29 years	1	60	60	.....	.....	.....	.....	.....	.....	60	1	80
30 years	1	60	60	.....	.....	.....	.....	.....	.....	60	1	8
31 years	1	60	60	.....	.....	.....	.....	.....	.....	60	1	17
33 years	1	60	50	.....	.....	.....	.....	.....	.....	50	.83	8
36 years	1	60	50	.....	.....	.....	.....	.....	.....	50	.83	58
37 years	1	60	60	.....	.....	.....	.....	.....	.....	60	1	97
38 years	1	60	60	.....	.....	.....	.....	.....	.....	60	1	28
60 years	1	45	50	.....	.....	.....	.....	.....	.....	50	1.11	6
Total	61	2,355	.....	.....	.....	.....	.....	.....	.....	2,722	1.15	12,980

From the foregoing table it will be seen that, of 61 cured hospital cases in this series, 45 received 1 treatment, 6 received 2, 6 received 3, 1 received 4, 1 received 5, and 2 received 7 courses of treatment; if, however, we base the comparison on the standard maximal dose for the age group in question, the following results are obtained:

4 cases were cured with a total of 0.5 of the maximal dose or less.
21 cases were cured with a total of a dose between 0.5 and 1 of maximal dose.
16 cases were cured with a total of 1 maximal dose.
10 cases were cured with a total of a dose between 1 and 2 maximal doses.
8 cases were cured with a total of a dose from 2 to 2.48 maximal doses, inclusive.
1 case was cured with a total of 3.33 maximal doses.
1 case was cured with a total of 5.33 maximal doses.

61 cases were cured with a total of an average of 1.15 maximal doses.

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Comparing now the 61 hospital with the 22 home cases, it is seen that while from a standpoint of caution a smaller number of home cases were cured on 1 treatment, the cures in general were effected with smaller sized doses (average, 0.84) than those used in the hospital cases (average, 1.15).

From the hospital cases it is seen that in the cure of 58 cases, 2,637 grains of thymol were used, and that from the stools of these patients 12,980 worms were collected. Thus on an average 1 grain of thymol expelled at least 4.7 worms. This conclusion is not, however, of any significance, for in one case 60 grains expelled only 1 worm, while in one course of treatment 25 grains expelled 2,246 worms (an average of 89.8 worms per grain of thymol).

Conclusions.—The general conclusions from the foregoing study seem to be—

(1) The present more or less frequently expressed desire to increase the dose of thymol considerably in excess of the present generally accepted maximal doses is not entirely unnatural, in view of the fact that so many patients fail to follow out the treatment until all the worms are expelled, and therefore a considerable number of persons continue to distribute the infection.

(2) Many cases of hookworm infection are cured by less than one maximal dose for the age group in question.

(3) When the thymol treatment is properly carried out, namely, when it is given under proper precautions, and the factor of safety to the patient is properly safeguarded, the present maximal doses seem to be entirely safe.

(4) The fact can not, however, be escaped that many of our patients are ignorant and illiterate, and can not be relied upon to carry out directions, and if the thymol dose in home treatment is in general increased, this must be done with a distinct risk that involves a totally unnecessary danger to a large number of patients who are completely cured with less than the present maximal dose.

(5) In view of the fact that not less than 11 deaths have occurred in the United States because of following thymol with castor oil instead of with salts, or because of carelessness on the part of the patient or his family, we do not consider it wise to have a general increase in the size of the dose of thymol in the home-treatment cases. We entirely concur with the field men who in clinic practice cut the doses down below the present grade.

(6) With an increase of sanitary privies, or with a repetition of smaller doses, the same eventual curative result will be obtained as would follow with an increased single dose of thymol; and while the former plan will take a longer time, it involves less risk, and the improved sanitation will give additional results in other diseases.

[1] With North Carolina State Board of Health since June 1, 1912.

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PROPORTION OF MALES TO FEMALES IN THE AMERICAN HOOK WORM (NECATOR AMERICANUS), BASED ON 13,080 WORMS FROM 102 CASES.

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The point was raised by Leichtenstern in 1885 that by counting the male and female hookworms passed by a patient and drawing the proportion, the clinician has a practical clue to the completeness or incompleteness of the cure effected. This point was based upon the premises that the males and the females are present in relatively fairly constant proportion and that the males are more difficult to expel than are the females.

This view of Leichtenstern, based upon the Old World hookworm (*Ancylostoma duodenale*), appears to be one that might in certain cases be of practical importance, and it seemed wise, therefore, to test it as applied to our American hookworm.

The opinion seems to prevail that in case of *Ancylostoma doudenale*, the female worms are much more numerous than the males. Bearing on this point, the following data are found in our notes (absence from library facilities at present prevents us from consulting some of the original articles):

Bilharz (1853, 55), Heller (1876b, 778), and R. Blanchard (1888a, 765) report 1 male to 3 females. White (1867, 427) states that the males are less numerous than the females. The following cases are reported with the number of males and females passed:

Number of—				Author.
Cases.	Worms.	Males.	Females.	
1	169	38	131	Leichtenstern, 1885, 501.
1	45	10	35	Do.
1	306	83	223	Do.
1	695	235	460	Leichtenstern, 1885, 501, Schumacher's case.
1	142	.....	142	Leichtenstern, 1886, 217, Schulthess's case.
1	647	188	459	Do.
1	64	13	51	Do.
1	250	.....	250	Do.
1	153	1	152	Do.
1	135	20	115	Do.
1	230	8	222	Do.
11	2,836	596	2,240	

In the foregoing 11 cases it is clear that the females (78 per cent) are in excess of the males (21 per cent). In 7 cases from Schulthess the females and males were about 6 to 1.

Leichtenstern (1886, 216–217) quotes two series of cases from Schulthess as follows:

Number of—			
Cases.	Worms.	Males.	Females.
26	6,134	1,811	4,323
(?)	4,111	1,367	2,744
26+	10,245	3,178 a 31	7,067 a 68

a Per cent.

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In these two series also it is clear that the females (68 per cent) are in excess of the males (31 per cent). In the series of 26 cases the variation was between 10 males to 360 females and 10 males to 11 females.

Leichtenstern remarks that the males may roll themselves up in the feces and be overlooked. He also states that cases occur in which only the females appear for two days after the anthelmintic, then the males appear.

From the foregoing statistics, based upon *Ancylostoma duodenale*, we were prepared to find similar conditions in the case of *Necator americanus*, especially since Lutz (who probably had Necator before him) is quoted as reporting for 3,000 worms a proportion of 3 females to 2 males.

In hospital work we usually have hookworm patients under observation only one day per week. It becomes necessary to inquire, therefore, into the number and proportion of worms passed in successive stools and on successive days, in order to have an indication of the proportion of worms that escape collection on the day of treatment.

Number of worms and proportion of sexes found in successive stools on day of thymol treatment.—The stools may follow each other so slowly or so rapidly, namely, so ununiformly, that a tabulation by actual stools has been followed in only a very few instances.

Case No. 3 (age 21 years) of our 1911 series shows the following data on day of treatment, dose 45 grains of thymol:

	Worms.		
	Males.	Females.	Total.
First stool	29	4	33
Second stool	?	?	61
Third stool	0	1	1
Total (3 stools)	29+	5+	95

Although in the second stools the males and the females were not separated, it is clear that in the first stool the males were greatly in excess of the females, and therefore that they were not more difficult to expel.

Case No. 63 (age 16) of our 1911 series shows the following data on first treatment, dose 10 grains of thymol (but the patient had received one treatment before he came to the Marine Hospital):

Date.	Stool.	Males.		Females.		Total worms.	Per cent of 347.
		Number.	Per cent.	Number.	Per cent.		
Aug. 4	First	1	50	1	50	2	0.57
Do	Second	50	39.6	76	60.3	126	36.3
Do	Third	48	44	61	55	109	31.4
Do	Fourth	18	60	12	40	30	8.6
Do	Fifth	21	36.8	36	63	57	16.4
Aug. 5	Sixth	13	68	6	31	19	5.4
Do	Seventh	2	50	2	50	4	1.1
Total		153	44	194	55	347	100

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In this treatment it is clear: (*a*) That the female worms were in excess of the males for the total treatment (7 stools) and for stools Nos. 2, 3, and 5; (*b*) that the males and females were equal in stools Nos. 1 and 7; and (*c*) that the males were in excess in stools Nos. 4 and 6.

The two cases cited do not seem to give us any clew of practical value in use of statistical data as to sexes in their order of expulsion in a given treatment.

In our notes we find two literature references for comparison. E. Parona, according to R. Blanchard (1888a, 765), reports a case as follows:

First stool contained 8 males and 104 females, total, 112 worms.
Second stool contained 16 males and 19 females, total, 35 worms.
Third stool contained 107 males and 66 females, total, 173 worms.

Blanchard (1888a, 765) also reports a case from Leichtenstern, as follows:

First stool contained 10 males and 124 females, total, 134 worms.
Second stool contained 28 males and 7 females, total, 35 worms.

It is not clear to us whether Parona's case involved 3 courses of treatment or 3 stools after 1 course of treatment, but our notes give the following data for Leichtenstern's (1885, 101) case:

	Worms.		
	Males.	Females.	Total.
First treatment, 15 Extr. fil. mar. (first 4 days)	10	124	134
Second treatment, 10 Extr. fil. mar	28	7	35
Total	38	131	169

Accordingly, positive data for comparison between *Necator americanus* and *Ancylostoma duodenale*, in respect to the point under discussion, are not available to us at present.

Duration of passage of worms after thymol.—In hospital work the average hookworm patient is, as stated above, usually under observation for only about 18 to 24 hours at a time. He is admitted to the wards late in the afternoon or early in the evening; he takes his thymol the next morning; by 1 to 4 o'clock in the afternoon he is over the effects of the salts and thymol to such an extent that he either desires to go home, or from a financial (administrative) point of view there is little or no justification in retaining him longer. Accordingly, under ordinary circumstances, opportunity is presented to collect the worms passed only up to 3 or 5 p. m. of the day of treatment. While this permits, doubtless, the collection of most of the worms, a number escape the observer, for they continue to pass for three or four days or more, as the cases following show.

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Date.	Grains thymol.	Males.		Females.		Total worms.	Per cent of total of each treatment.
		Number.	Per cent.	Number.	Percent.		
Case No. 63.							
Aug. 4	10	138	42.5	186	57.5	324	86.
Aug. 5	.....	15	65.2	8	34.8	23	6.
Aug. 6	.....	6	22.2	21	77.8	27	7.2.
Total	10	159	42.5	215	57.5	374	
Aug. 8	10	1	25	3	75	4	80.
Aug. 9	.....	.....	.....	1	100	1	20.
Total	10	1	20	4	80	5	
Case No. 179.							
July 3	15	19	43.1	25	56	44	95.6 per cent of 46.
July 4	.....	.....	.....	1	100	1	2.2 per cent of 46.
July 8	.....	.....	.....	1	100	1	2.2 per cent of 46.
Total	15	19	41.3	27	58.7	46	
July 21	25	29	41	41	58	70	77.8 per cent of 90.
July 22	.....	4	100	.....	.....	4	4.4 per cent of 90.
July 23	.....	4	50	4	50	8	8.9 per cent of 90.
July 24	.....	.....	.....	1	100	1	1.1 per cent of 90.
July 25	.....	3	50	3	50	6	6.7 per cent of 90.
July 26	.....	.....	.....	1	100	1	1.1 per cent of 90.
Total	25	40	44.4	50	55.6	90	
July 27	30	5	22.7	17	77.3	22	73.3 per cent of 30.
July 29	.....	.....	.....	2	100	2	6.7 per cent of 30.
July 30	.....	1	25	3	75	4	13.3 per cent of 30.
Aug. 2	.....	1	50	1	50	2	6.7 per cent of 30.
Total	30	7	23.3	23	76.7	30	
Aug. 3	30	6	35.3	11	64.	17	100 per cent of 17.
Case No. 200.							
Aug. 12	45	275	46.5	312	53.1	587	96.2.
Aug. 14	.....	7	53.8	6	46.1	13	2.1.
Aug. 15	.....	3	30	7	70	10	1.6.
Total	45	285	46.7	325	53.2	610	100.
Aug. 17	45	48	52.7	43	47.2	91	96.8
Aug. 19	.....	1	33.3	2	66.2	3	3.1.
Total	45	49	52.1	45	47.8	94	100.
Aug. 22	45	10	47.6	11	52.3	21	77.7
Aug. 24	.....	5	83.3	1	16.6	6	22.2.
Total	45	15	55.5	12	44.4	27	100.
Aug. 25	45	.....	.....	2	100	2	100.

From the foregoing cases it is clear that all worms expelled by a given course of treatment need not necessarily be passed on the day of treatment, but while about 75 to 95 per cent of the specimens expelled may be passed within 12 hours after the drug is administered, worms may continue to pass for five or six days.

It further seems evident from the foregoing records that the males and females do not follow any regular order in passing which can be used as a practical indication as to the completeness or incompleteness of the cure.

Two practical conclusions are to be drawn from the foregoing data:

(1) Since 75 to 95 per cent of the worms pass during the first 12 hours after administration, all hospital records that give the number of worms collected during this period are subject to a theoretical

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error of about 5 to 33 per cent; that is to say, the actual number of worms passed may be from one-twentieth up to one-third larger than actually reported. This point should be borne in mind when comparing statistics derived from treatment with statistics derived from autopsy not preceded by treatment.

(2) It occasionally occurs that on the day of treatment not a single worm is collected, but later, microscopic examination is negative. Probably the correct conclusion is that the worms have been passed after the patient has been discharged.

Proportion of male and female hookworms passed after thymol treatment.—In nearly all of the following cases the worms were collected within 12 hours (namely by 6 p. m.) after the first dose of thymol (which is given at 6 a. m.).

Two groups of cases, each with three subgroups, may be compared:

In the first group are found 58 cured male cases, arranged in 3 subgroups according to the preponderance of male worms, equal number of males and females, and preponderance of female worms.

Of these 58 patients 18 cases (or 31 per cent) showed more male (59 per cent) than female (40 per cent) hookworms; 5 cases (8 per cent) have an equal number of male and female worms; 35 cases (60 per cent) have an excess of females. Thus, on basis of these cases, the chances are about 6 out of 10 that there will be an excess of females, but this percentage is not high enough to put to any practical account in determining, by counting the males and females collected, whether or not the patient is entirely freed from his worms. In fact, the labor involved would be much greater, more tedious, and more disagreeable than the labor involved in making a new microscopic examination a few days later.

The 18 cases with an excess of males showed 1,378 worms, 821 of which (or 59 per cent) were males, and 557 of which (or 40 per cent) were females.

The 5 cases with equal number of male and female worms were all light infection, averaging only 11.6 worms each.

The 35 cases with more females than males showed 6,524[1] worms, 2,797 of which (or 43 per cent) were males, and 3,727 of which (or 57 per cent) were females.

Of the total 7,960[1] worms collected from the 58 cases, 3,647 specimens (or 45 per cent) were males, and 4,313 specimens (or 54 per cent) were females.

In respect to number of worms present, the cases with equal males and females averaged the smallest number of worms (11), those with an excess of males came next (76), and those with an excess of females came next (186). The average was 137 worms. Thus, in general, the heaviest infections were those with the largest number of females, but this is not of much significance, since only 9 of the 35 female-excess cases were above the average (139) in number of worms present, while 2 of the 18 male-excess cases were above the average.

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The "cured" [2] cases are given in the following table:

Tabulation of 58 cured male hospital cases according to total number of worms and preponderance of sex of parasites.

A. 18 CASES WITH EXCESS OF MALES.

Case No.	Worms.		
	Total.	Males.	Females.
111	474	277	197
26	143	74	69
163	138	82	56
11	111	65	46
144	97	58	39
29	95	68	27
66	72	37	35
67	68	36	32
103	62	45	17
165	42	31	11
31	37	21	16
55	9	6	3
139	8	5	3
58	7	6	1
92	7	4	3
73	6	4	2
15	1	1	0
125	1	1	0
Total 18	1,378	821	557
Per cent	.....	59	40

B. 5 CASES WITH EQUAL MALES AND FEMALES.

42	44	22	22
53	6	3	3
170	4	2	2
169	2	1	1
62	2	1	1
Total 5	58	29	29
Per cent	.....	50	50

C. 35 CASES WITH EXCESS OF FEMALES.

78	[a] 2,251	1,049	1,202
110	1,142	564	578
63	633	234	399
39	538	254	284
24	506	173	333
23	295	99	196
27	170	77	93
41	167	52	115
119	150	43	107
44	113	55	58
83	92	16	76
34	80	35	45
56	73	27	46
21	72	32	40
92	58	24	34
32	28	11	17
70	24	9	15
157	21	10	11
74	19	6	13
80	17	4	13
75	14	5	9
52	11	5	6
87	8	3	5
90	7	3	4
108	7	3	4
109	6	2	4
93	5	1	4
13	4	1	3
7	3	0	3
89	3	0	3
172	2	0	2
153	2	0	2
91	1	0	1
140	1	0	1
88	1	0	1
Total 35	[a] 6,524	2,797	3,727
Per cent	.....	43	57

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Tabulation of 58 cured male hospital cases according to total number of worms and preponderance of sex of parasites—Continued.

D. SUMMARY OF 58 CURED CASES.

Case No.	Worms.		
	Total.	Males.	Females.
A (18 cases).....	1,378	821	557
B (5 cases).....	58	29	29
C (35 cases).....	[a] 6,524	2,797	3,727
Total (58 cases)	[a] 7,960	3,647	4,313
Per cent.....	.....	45	54

[a] Plus 26, sex of which was not determined.

For comparison with these 58 complete cures, 44 male hospital cases can be presented in connection with which it is either definitely known that later microscopic examination (in 1911) was positive (hence the cure was incomplete), or through failure to obtain specimens the completeness or incompleteness of the cure was left in doubt.

Of these 44 cases, 19 patients (or 43 per cent) showed an excess of males; there was a total of 2,738 worms, 1,468 (or 53 per cent) of which were males and 1,270 (or 46 per cent) of which were females. These percentages are not very different from those of the corresponding cured cases.

Of the 44 cases, 4 patients (or 9 per cent) showed an equal number of males and females. All were light infections, averaging only 10.5 worms each.

Of the 44 cases, 21 patients (or 47 per cent) showed an excess of females; of a total of 2,340 worms, 1,001 specimens (or 42 per cent) were males and 1,339 specimens (or 57 per cent) were females.

The cases in question are tabulated as follows:

Tabulation of 44 male hospital cases, some with incomplete cure, some without final data as to cure, arranged according to total number of worms and preponderance of sex of parasites.

A. 19 CASES WITH EXCESS OF MALES.

Case No.	Worms.		
	Total.	Males.	Females.
85.....	710	387	323
57.....	695	353	342
94.....	366	188	178
69.....	315	163	152
141.....	172	89	83
12.....	158	82	76
9.....	85	60	25
47.....	70	39	31
88.....	58	31	27
3.....	34	29	5
143.....	20	11	9
20.....	11	6	5
46.....	10	7	3
65.....	9	5	4
115.....	7	4	3
95.....	5	5	0
79.....	5	3	2
97.....	5	3	2
145.....	3	3	0
Total (19)	2,738	1,468	1,270
Per cent....	.....	53	46

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Tabulation of 44 hospital cases, etc., arranged according to total number of worms and preponderance of sex of parasites.

B. 4 CASES WITH EQUAL MALES AND FEMALES.

Case No.	Worms.		
	Total.	Male.	Female.
158	18	9	9
74	10	5	5
118	10	5	5
104	4	2	2
Total (4)	42	21	21
Per cent		50	50

C. 21 CASES WITH EXCESS OF FEMALES.

68	366	158	208
30	347	163	184
45	315	128	187
10	257	109	148
99	256	125	131
117	199	91	108
16	170	62	108
2	113	39	74
1	93	43	50
71	86	40	46
5	39	13	26
116	32	10	22
72	16	7	9
356	15	5	10
126	9	3	6
33	7	3	4
136	5	0	5
105	4	0	4
137	4	1	3
6	4	1	3
154	3	0	3
Total (21)	2,340	1,001	1,339
Per cent		42	57

D. SUMMARY.

A (19 cases)	2,738	1,468	1,270
B (4 cases)	42	21	21
C (21 cases)	2,340	1,001	1,339
Total (44 cases)	5,120	2,490	2,630
Per cent		48	51

Comparing these statistics with the sex statistics of the cured cases, it is not evident that the proportion of the sexes gives us any practical clue to the question whether our patient is or is not cured.

Combining the two sets of statistics we have the following table:

Table of worms, by sex, in 102 cases.

Cases.	Total. worms.	Males.		Females.		Average worms per case.
		Number.	Per cent.	Number.	Per cent.	
Cured (58)	[a] 7,960	3,647	46	4,313	53	137
Others (44)	5,120	2,490	48	2,630	51	116
Total (102)	13,080	6,137	46	6,943	53	128

[a] Plus 26 worms, sex of which was not determined.

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Tabulation of 58 cu

of complete cures give data as to sex of para-
treatments:

male worms *in different treatments of 58 cases.*

E CASES C N ONE TREATMENT.

	Tot	Males.		Females.	
		Number.	Per cent.	Number.	Per cent.
al (58 case		45	0	0	0
			37	15	62
			59	39	40
			28	107	73
ns 26, se		ot determined.		3	100
				115	68
				11	26
				1	100
				3	68
				4	80
				1	100
				27	37
				20	55
				3	75
				4	57
				2	15
				27	52
				1	33
				2	3
				83	
				76	
				25	
				31	
				27	
				5	
		11		9	
		6		5	
		7		3	
		5		4	
		4		3	
		5		0	
5		3		2	
5		3		2	
3		3		0	
	2,738	1,468		1,270	
		53		46	

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Proportion of male and of female worms passed, etc.—Continued.

C. SIX CASES CURED IN THREE TREATMENTS.

Case No.	Age.	Grains.	Total worms collected.	Males.		Females.	
				Number.	Per cent.	Number.	Per cent.
108.....	6	7.5	23	17	73	6	26
		10	20	15	75	5	25
		10	19	13	68	6	31
		27.5	62	45	72	17	27
111.....	10	20	449	266	59	183	40
		20	22	11	50	11	50
		20	3	0	0	3	100
		60	474	277	58	197	41
44.....	12	10	113	55	48	58	51
		10	0	0	0	0	0
		20	0	0	0	0	0
		40	113	55	48	58	51
27.....	13	20	122	56	45	66	54
		20	25	12	48	13	52
		30	23	9	39	14	60
		70	170	77	45	93	54
66.....	14	20	54	23	51	26	48
		20	8	4	50	4	50
		25	10	5	50	5	50
		65	72	37	51	35	48
39.....	16	20	369	183	49	186	50
		25	162	68	41	94	58
		30	7	3	42	4	59
		75	538	254	47	284	52
Total (6).....		337.5	1,429	745	52	684	47

D. ONE CASE CURED IN FOUR TREATMENTS.

78.....	17	25	2,246	1,048	46	1,198	53
		25	26	(?)	(?)	(?)	(?)
		25	2	1	50	1	50
		25	3	0	0	3	100
Total..		100	2,277	1,049+	47	1,202+	53

E. ONE CASE CURED IN FIVE TREATMENTS.

23.....	10	12	54	40	74	14	25
		15	11	5	45	6	54
		12.5	218	52	23	166	76
		15	1	1	100	0	0
		20	11	1	9	10	90
Total..		74.5	295	99	33	196	66

F. TWO CASES CURED IN SEVEN TREATMENTS.

24.....	12	20	109	49	44	60	55
		20	267	91	34	176	65
		20	53	15	28	38	71
		25	24	6	25	18	75
		25	36	10	27	26	72
		25	8	2	25	6	75
		25	9	0	0	9	100
		160	506	173	34	333	65
63.....	16	10	374	159	42	215	57
		15	5	1	20	4	80
		25	218	67	30	151	69
		15	0	0	0	0	0
		25	15	2	13	13	86
		30	19	4	21	15	78
		30	2	1	50	1	50
		150	633	234	36	399	63
Total (2).....		310	1,139	407	35	732	64

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Tabulating the summaries according to the number of treatments, we obtain the following:

Cases.	Treatments to cure.	Total worms.	Males.		Females.	
			Number.	Per cent.	Number.	Per cent.
A (43)	1	1,418	660	46	758	53
B (6)	2	1,428	687	48	741	51
C (5)	3	1,429	745	52	684	47
D (1)	4	[a]2,251	1,049+	46	1,202+	53
E (1)	5	295	99	33	196	66
F (2)	7	1,139	407	35	732	64
Totals [b] (59 cases)	96	7,960	3,647	46	4,313+	53

[a] Plus 26, sex of which was not determined.
[b] The 58 cases given in p. 726, plus 1 case in which worms were not found in the stools.

From these tables it is not evident that the greater the percentage either of males or of females the greater the number of treatments necessary. Accordingly it is not evident that there is any striking difference in difficulty in expelling males or females, so far as the number of treatments is concerned.

SUMMARY.

In view of the statements published in reference to the proportion of the sexes in *Ancylostoma duodenale*, a study of the statistics in 102 cases of infection with *Necator americanus* is distinctly disappointing and the conclusion seems justified that whatever may be the practical value of estimating the sexes of *A. duodenale*, from a standpoint of obtaining a clew as to whether or not the cure is complete, this method of procedure, as applied to the average hospital case of *N. americanus*, does not appear to present any practical advantage. In fact, the method is much more tedious, more time consuming, and less reliable than our present method of microscopic examination and therefore its adoption in our hookworm-eradication campaign is not to be recommended.

As a purely academic matter it is interesting to note that of 13,080 specimens of *Necator americanus* collected from 102 cases, 46 per cent of the specimens were males and 53 per cent were females, but the proportion for different cases varied, some cases presenting more males than females, others more females than males.

Of 102 cases examined, 37 presented an excess of males, 9 presented an equal number of males and females, and 56 presented an excess of females.

In 58 cured cases in New Hanover County, N. C., the greatest number of worms collected from any one case was 2,277, the smallest number 1, the average number 135.

About 75 to 95 per cent of the worms of a given course of treatment may be passed within 12 hours after the early (6 a. m.) dose of

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thymol and worms may continue to pass for several, apparently for at least 6, days following.

From this latter fact the important practical conclusion may be deduced that treatment once per week, as is usual at present, is as frequent as it seems either necessary or wise to give it. Treatment more often than once a week may be entirely unnecessary, even if eggs be found the fifth day after treatment, and since the factor of safety to the patient should be constantly held in mind, thymol treatment oftener than once a week seems justified only in exceptional cases which may present special features or circumstances that indicate the practicability of more frequent dosage.

[1] Plus 26 worms, the sex of which was not determined.

[2] "Cured" means that later microscopic examination was negative.

UNCINARIASI OD ANCHILOSTOMIASI.

Prof. E. Perroncito.

Uncinariasi, uncinariosi od anchilostomiasi si dice la malattia dovuta alle uncinarie od anchilostomi, cioè a vermi della grande famiglia degli strongilidi, specie del genere *Uncinaria* Frolich, 1789; *Agchylostoma* od *Anchylostoma* Dubini, 1838, 1843, 1850; *Dochmius* Dujardin, 1845; *Uncinaria* Railliet, 1885, e Blanchard; *Necator* Stiles, 1902–3. Essi vivono ematofagi, parassiti del tenue intestino, producenti più o meno gravi anemie, come l'*Uncinariosi* od *Anchilostomiasi duodenale*[1] e l'*Uncinaria americana*[2] nei minatori (anemia dei minatori), fornaciai (anemia dei fornaciai) e contadini dei luoghi caldi ed umidi (clorosi egiziana), delle zone temperate o fredde, delle regioni tropicali (anemia intertropicale), in tutto il mondo; l'Uncinaria trigonocephala o canina[3] e l'*Uncinaria stenocephala*[4] nel cane e nel gatto;[5] l'*Ucinaria cernua*[6] negli ovini; l'*Uncinaria radiata*[7] nei bovini; l'*Uncinaria concepati*[8] nel zorrino dell'Argentina.

Le uncinarie hanno tutte analoga curvatura dorsale nella regione cervicale del corpo, un'armatura della bocca che si distingue per una capsula munita di denti uncinati, od a lancetta, chitinosi, atti a traforare, lacerare ed a fissarsi nella mucosa dell'intestino tenue (specialmente duodeno e digiuno) nel quale vivono, s'accoppiano e producono uova feconde, nel mentre succhiano sangue e svolgono emorragie capillari attraverso alle ferite dei villi intestinali.

Le uncinarie nel contenuto fluido o semi-fluido dell'intestino godono di movimenti vivacissimi, per cui si rendono facili gli accoppiamenti tra maschi e femmine, e cambiano spesso di sede producendo molteplici morsicature o ferite emorragiche, attraverso alle quali possono facilmente verificarsi autointossicazioni ed infezioni bacteriche diverse (septicemie).

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Le uova feconde delle uncinarie una volta emesse si mescolano coll contenuto intestinale e vengono eliminate coll'alvo per germogliare fuori del corpo, non potendo sviluppare l'embrione nell'organismo oste del verme adulto. All'aria aperta, in ambiente caldo ed umido, nelle feci stesse si inizia o procede ulteriormente la segmentazione del vitello dell'uovo.

L'embrione una volta maturo, diventato larva vitale, sfonda il sottile guscio dell'uovo e come verme libero, agamo e rabditiforme si nutre dei detriti organici delle feci stesse dell'uomo e delle specie animali. In questo stadio di vita libera le larve sono molto attive, forti e vivaci, e in 2, 4, e 5 giorni, senza subire alcuna muta, a seconda del sustrato e della temperatura ambiente, raggiungono il periodo di maturazione larvale, o di incistidamento (incapsulamento), che si rivela per una trasformazione particolare del tubo digerente, rischiaramento di tutto il corpo e la formazione di una cisti cuticolare che ne ripete la forma e raccoglie la larva vivacissima.

In questo secondo stadio o fase di vita libera, se la cisti si calcifica le larve mature rimangono come sequestrate nella loro cisti o capsula pressochè immobili, e possono mescolate colle polveri, trasportate coi venti o colle acque, diffondere la specie parassitaria. Se invece la cisti si conserva chitinosa questa si adatta ai movimenti della larva vivacissima per molti giorni e mesi, potendo vivere nelle acque potabili o meno, 8–10 e piu mesi in attesa di essere ingerita dall'uomo, o da specie animali adatte per proseguire nel suo corso evolutivo nel tubo digerente ed arrivare allo stato di verme perfetto, parassitario, per ricominciare gli accoppiamenti, la fecondazione e la deposizione di uova destinate a perpetuare la specie nel modo indicato.

Le larve mature delle uncinarie contenute nelle acque, nel limo o fango, venendo a contatto della pelle dei piedi, delle gambe, mani e braccia, ecc., vi si fissano e l'attraversano come avevo già sospettato e indicato fin dal 1880, e Loos pel primo ha dimostrato; spogliate della loro cisti o capsula arrivano nel derma e connettivo sottocutaneo, penetrano nel circolo sanguigno e raggiungono i polmoni, donde passano negli alveoli od infundibuli polmonari per risalire nei bronchi e trachea fino alla faringe, e da questa coll'alimento, o la saliva procedere nello stomaco ed intestino, ove si sviluppano ulteriormente per raggiungere in 20 giorni, o poco più, lo stato di verme perfetto.

È naturale che in codesti viaggi non tutte le larve arrivino in terreno propizio, a destinazione, e talune si disperdano vaganti nell'organismo per incistidarsi nei tessuti, oppure rimangano nel circolo sanguigno, come fanno talune specie di strongili (sclerostomi) negli equini. Ma la pluralità delle larve uncinarie entra nell' orga-

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nismo coll' alimento fluido o solido e raggiunge lo stato di verme perfetto dentro il tubo digerente per ricominciare la vita parassitaria ed il perpetuamento della specie.

Le larve uncinarie, come quelle dei vermi in generale, tendono a vivere in colonie, donde la possibilità di gravi infezioni di uncinarie in taluni, e la incolumità di altri che hanno bevuto le stesse acque inquinate; solo che i primi capitarono ingoiare le parti dell'acqua contenenti colonie di larve mature, ai secondi è toccata la parte dell'acqua immune, senza larve.

Le larve delle uncinarie in qualsiasi loro stadio di sviluppo, giovani o mature, muoiono in pochi minuti alla temperatura di 48–50° C.; e trattate coll'estratto etereo di felce maschio, col thimolo, colle soluzioni di acido fenico (fenolo), di acido cloridrico o solforico, di cloruro di sodio, ecc. ecc., donde l'azione terapeutica efficace delle tre prime e quella profilattica delle altre sostanze chimiche o medicamentose da me dimostrata sperimentalmente fin dal 1880 e che ebbe una fortunata ed estesissima applicazione.[1] Così, l'estratto etereo de felce maschio ed il formolo amministrati ad alte e repetute dose diedero i noti eccelenti resultati nel vecchio e nuovo continente, ed il cloruro di sodio applicato da Manouvrier in Francia ebbe tale successo da spingere altre nazioni ad applicarlo.

ORDINE DEL GIORNO PROPOSTO DAL PROF. PERRONCITO.

Il XV. Congresso di Igiene e Demografia di Washington, mentre plaude alle nazioni che hanno già convenientemente provveduto, fa voti che:

a) La Parassitologia diventi cattedra di insegnamento fondamentale obbligatorio in tutte le Facoltà e Scuole Mediche, in tutti gli Istituti e Scuole Superiori Veterinarie, e di Agricoltura, largamente dotata per un'insegnamento sperimentale pratico e dimostrativo;

b) Una Lega o Commissione internazionale venga constituita tra gli igienisti ed i sanitari allo scopo di combattere le Uncinariosi od Anchilostomiasi in tutte le regioni del globo, mediante ricerche diagnostiche nei centri infetti o sospetti, cure razionali e mezzi preventivi fondati sulle conoscenze scientifiche odierne, che valsero già a far scomparire, od a diminuire notevolmente i tristi effetti dell'anemia dei minatori di Schemnitz (Selmeczbányá) in Ungheria; delle miniere carbonifere del Belgio, della Francia, della Germania (Provincie Renane e della Westfalia), dell'Inghilterra, nell' Egitto, degli Stati Uniti d'America, a Porto-Rico, nel Brasile, nelle Indie, ecc. ecc., e che, applicati con diligenza nell'opera titanica del traforo del Sempione, impedirono qualunque caso di anchilostomiasi o uncinariosi nelle migliaia di operai che vi lavorarono per 6–7 anni.

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[1] *Anchylostoma duodenale* scoperto da Dubini, nel 1838, class. nel 1843–1850; *Strongylus quadridentatus* Von Siebold, 1851; *Dochmius anchylostomum* Molin, 1860; *Sclerostoma duodenale* Cobbold, 1864; *Str. duodenalis* Schneider, 1866; *Dochmius duodenalis* Leuckart, 1876; *Uncinaria duodenalis* Railliet, 1885; R. Blanchard, 1895.

[2] *Uncinaria americana* W. Stiles, 1902; *Necator americanus* W. Stiles, 1903; *Anchilostoma americanum* Verdun, 1907.

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[3] *Uncinaria trigonocephala* (Rud.), Railliet; *Uncinaria vulpis* Frolich, 1789; *Str. trigonocephalus e tetragonocephalus* Rudolphi, 1808; *Dochmius trigonocephalus* Dujardin, 1845; *Str. caninum* Ercolani, 1859; *Dochmius balsami* B. Grassi e C. Parona, 1877.

[4] *Uncinaria stenocephala* Railliet, *Dochmius stenocephalus* Railliet, 1884.

[5] *Dochmius balsami* B. Grassi e C. Parona, 1877; *Uncinaria balsami* Perroncito.

[6] *Uncinaria cernua* Railliet, 1885; *Strongylus cernuus* Creplin, 1829; *Monodontus wedlii* Molin, 1860; *Dochmius cernuus* C. Baillet, 1868.

[7] *Uncinaria radiata* Railliet, 1885; *Strong radiatus* Rudolphi, 1803.

[8] *Uncinaria conepati* Perroncito; *Agchylostoma conepati* A. Railliet, 1909; Kurt Wolffhügel, 1908; Emilio Solanet, 1911.

[9] E. Perroncito, Osservazioni elmintologiche relative alla malattia sviluppatasi endemica negli operai del Gottardo. Reale Accademia dei Lincei, Roma, 2 maggio 1880; L'anemia dei contadini, fornaciai e minatori in rapporto coll'attuale epidemia negli operai del Gottardo. Torino 29 dicembre 1880; Y parassiti dell'uomo e degli animali utili. 2ª edizione, Milano, 1904; La malattia dei minatori.—Dal S. Gottardo al Sempione—Una questione risolta. Torino, 1909–10.

DER INFEKTIONSWEG BEI STRONGYLOIDES UND ANKYLOSTOMUM.

Prof. Dr. F. Fülleborn, Hamburg. Aus dem Institut für Schiffs- und Tropenkrankheiten, Hamburg.

Um zu prüfen, ob die von Looss behauptete Wanderung der perkutan eingedrungenen Ankylostomumlarven[1] via Lunge, Trachea, Oesophagus und Magen zum Darm wirklich stattfindet resp. welche Bedeutung ihr zukommt, oder ob es sich andererseits, wie Sambon meint, bei den in der Trachea gefundenen Ankylostomumlarven nur um versprengte Exemplare handelt, während der Hauptinfektionsweg direkt durch die Blutgefässe in den Darm führe, wurden mit Strongyloides und Hunde-Ankylostomen die folgenden Versuche angestellt, deren operativer Teil von Dr. Schilling-Torgau ausgeführt wurde.

Hunden wurde die Trachea in der Nähe des Kehlkopfes völlig durchtrennt und der die Kanüle tragende Teil mehrere Zentimeter von dem oberen Trachealabschnitte verlagert, sodass eine direkte Ueberwanderung von Larven aus den Lungen zum Oesophagus unmöglich wurde. Wurden solche Hunde reichlich perkutan infiziert, so erschienen die Strongyloides- und Ankylostomumlarven nach einiger Zeit massenhaft in dem Trachealkanülensekret. Diese Hunde bekamen zwar auch eine Infektion des Darmes, jedoch gelangte bei ihnen im Vergleich zu den nicht tracheotomierten Kontrollhunden nur ein verschwindend kleiner Bruchteil von Parasiten zur Ansiedlung in Darme.

Das gleiche Resultat wurde erhalten, wenn vor der Infektion der Oesophagus quer durchtrennt und die Enden entfernt in die Haut verpflanzt wurden; die Larven wurden alsdann über Trachea und Rachen mit dem Speichel aus dem oberen Speiseröhrenstumpf entleert.

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Bei nicht operierten Hunden konnten die allmählich heranwachsenden Larven auf dem ganzen Wege von der Trachea bis zu dem definitiven Sitz im Darm verfolgt werden, also auf den Wandungen des Oesophagus, des Magens und des Duodenums nachgewiesen werden und zwar sowohl Ankylostomum wie Strongyloides.

Mithin kann bestätigt werden, dass die von Looss entdeckte Wanderung der Larven durch die Trachea via Oesophagus und Magen zum Darm nicht nur tatsächlich besteht, sondern den bei weitem wichtigsten Weg für die subkutan eingedrungenen Larven darstellt.

Andererseits zeigte sich jedoch, dass ein, wenn auch kleiner Teil der Larven nach Passage der Lungen in den grossen Kreislauf gelangen muss, sonst würden die Hunde mit durchschnittener Trachea resp. Oesophagus überhaupt infektionsfrei geblieben sein. Tatsächlich fanden sich auch bei subkutan mit Strongyloides infizierten Hunden fast regelmässig filariforme Larven in den Nieren, wo sie zu recht charakteristischen Veränderungen Veranlassung geben;[2] dass aber nach dem Passieren der Lungen in den grossen Kreislauf eingeschwemmte und so in die Darmgefässe gelangte Strongyloideslarven sich im Darme auch festsetzen können, wurde dadurch bewiesen, dass ein Hund eine starke Strongyloidesinfektion bekam, als man ihm den larvenhaltigen Trachealschleim eines anderen perkutan infizierten Hundes in eine Duodenalarterie eingespritzt hatte.

Also auch die Ansicht von Sambon besteht wenigstens teilweise zu Recht, wennschon die Infektion nach dem Looss'schen Modus bei weitem die wichtigere Rolle spielt.

Sehr merkwürdig ist es, dass direkt per os in den Magen gebrachte filariforme Strongyloideslarven (über Ankylostomum sind die Versuche noch nicht abgeschlossen) daselbst sämtlich zugrunde zu gehen scheinen bis auf diejenigen, welchen es gelingt, in die Magenwandung einzudringen, um dann via Gefässsystem (man findet sie in den Lymphgefässen der Magensubserosa und in denen der Leber), rechtes Herz, Lunge, Trachea und Oesophagus dorthin zurückzukehren. Nach der Lungenpassage werden die Strongyloideslarven, die auch ihr Bohrvermögen eingebüsst zu haben scheinen, aber gegen die Wirkung der Verdauungssäfte offenbar widerstandsfähiger; denn gibt man Hunden mit durchschnittener Trachea die larvenhaltige Lunge von anderen perkutan infizierten Hunden zu fressen, so erfolgt eine sehr intensive Darminfektion, im Gegensatz zu solchen Hunden, die mit Filariformen, die eine solche Lungenpassage nicht durchgemacht haben, gefüttert wurden.

Uebrigens gelangte ein Teil der Strongyloideslarven in unseren Versuchen regelmässig in der Trachea der Versuchshunde zur vollständigen Geschlechtsreife (filariformes Zwitterstadium) und produzierte in der Trachea auch Rhabditisbrut; letztere konnte auch

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bei einer mit Strongyloides infizierten menschlichen Leiche konstatiert werden. Ueber das weitere Schicksal dieser Rhabditisbrut sind die Versuche noch nicht abgeschlossen; es sei nur bemerkt, dass es in der Trachea nicht zur Entwicklung einer Rhabditisgeschlechtsgeneration kommt und dass auch nicht auf direktem Wege filariforme Larven daraus entwickelt werden.

Durch die Tatsache der Ansiedlung in der Trachea gewinnt Strongyloides noch nähere biologische Beziehungen als bisher bekannt zu dem in der Froschlunge parasitierenden Rhabdonema nigrovenosum, und die eigenartige Wanderung der perkutan eingedrungenen Strongyloides- und Ankylostomumlarven durch die Trachea zum Magen wird uns vom phylogenetischen Gesichtspunkte aus verständlicher.

[1] Ein Eindringen der Ankylostomum- und Strongyloides-Larven in die Haut findet auch dann statt, wenn die Larven sich dabei in Wasser flottierend befinden.

[2] Das Vorkommen von Ankylostomumlarven in den Nieren ist von Sambou als Stütze für seine Theorie herangezogen worden. Auch Looss erwähnt das gelegentliche Vorkommen von versprengten Ankylostomumlarven.

DAS OLEUM CHENOPODII ANTHELMINTICI GEGEN ANKYLOSTOMIASIS IM VERGLEICH ZU ANDEREN WURMMITTELN.

Dr. W. Schüffner und Dr. H. Vervoort. Aus dem Hospital der Senembah Maatschappy in Deli.

Solange man Vermifuga nur gegen Ascariden oder Tänien nötig hatte, und die Ancylostomiasis höchstens sporadisch in Europa zu tun gab, blieb die Frage nach dem besten Wurmmittel von untergeordneter Bedeutung. Ganz anders hat sich die Sachlage heute gestaltet, wo die Erkenntnis der ungeheuren Ausbreitung des Hakenwurmes in den warmen Ländern und des grossen wirtschaftlichen Schadens, den er verursacht, in den weitesten Kreisen Platz greift. Als eine der wichtigsten Abwehrmaassregeln gegen den gefährlichen Parasiten ist damit die Abtreibekur in den Mittelpunkt des Interesses gerückt, und der Mangel eines wirksamen Wurmmittels, das nicht von vornherein durch seine schlechte Einnehmbarkeit abschreckt, sondern ähnlich den Wurmplätzchen eine gewisse Popularität erwerben könnte, recht fühlbar geworden.

Diese Lücke auszufüllen, dazu scheint uns nach ausgedehnten vergleichenden Untersuchungen das Oleum chenopodii anthelmintici, auf das wir durch eine Arbeit von Brüning und mündlich durch Dr. v. Prowazek aufmerksam gemacht wurden, berufen zu sein.

Das Oleum chenopodii anthelmintici ist ein ätherisches Oel von hellgelber Farbe und eigenartigem, nicht unangenehmen Geschmack, und wird aus einer in fast allen Teilen der Vereinigten Staaten Ameri-

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kas[1] wachsenden, krautartigen Pflanze, dem Chenopodium anthelmintici gewonnen. In Amerika ist es offizinell, aber in Deutschland[2] merkwürdiger Weise so gut wie unbekannt. Nach Brüning hat man an ihm ein sicher wirkendes, von allen Nebenwirkungen fast freies Vermifugum, das er vor allem auch den Tropenärzten zu Versuchen gegen das Ancylostomum empfiehlt.

Wir ordneten das Mittel einer Untersuchungsreihe ein, die den einen von uns schon seit Monaten beschäftigte, und die den Zweck hatte, die Leistungsfähigkeit des Thymols gegenüber anderen neuerdings aufgekommenen Arzneien festzustellen, und möglichst zahlenmässig zu beweisen, dass es den Vorzug, den wir ihm in Deli bei einer sehr umfangreichen Bekämpfung der Ancylostomiasis seit 15 Jahren einräumen, auch wirklich verdient.[3] Es handelte sich dabei um den Vergleich mit Oleum eucalypti, einer jetzt in niederländisch Indien viel gebrauchten Vorschrift, und mit Beta-Naphthol, das von Englisch-Indien empfohlen wird. Das in Europa beliebteste Mittel, das Extractum filicis (Maris) kam für uns auf Grund älterer Versuche, nach denen es sich in den Tropen wenig verlässlich zeigte, nicht in Betracht. Als drittes zogen wir das Ol. Chenopodii heran.

Die Prüfung, für die uns in Deli ein reiches Krankenmaterial zu Gebote stand erstreckte sich bisher auf 1457 Personen mit doppelt so vielen Kuren, während eines ca. achtmonatlichen Zeitraums. Dabei hielten wir uns an eine besondere Versuchsanordnung, die den Zweck hatte, Fehlerquellen, welche bei ähnlichen Arbeiten das Resultat stark beeinträchtigen mussten, mit Sicherheit auszuschalten.

Wir liessen nämlich unsere Wurmkranken zwei Kuren im Abstand von wenigen Tagen machen, und zwar regelmässig alternierend mit Thymol und einem der zu prüfenden Mittel. Auf diese Weise erhielten wir jedesmal zwei Reihen, die eine, in der die Leute das Thymol an erster Stelle, die andere, in der sie es an zweiter genommen hatten. Beide Mittel hatten so Gelegenheit, zu zeigen, welche Kraft sie auf die zuvor nicht behandelten Parasiten entfalten konnten, und dann, was sie noch in der Nachkur vermochten. Die vermifugen Kräfte waren dann direkt porportional den Zahlen der Würmer, die sich in den ausgewaschenen Stühlen vorfanden.

Da es uns hier allein auf das Verhältnis ankam, in welchem die dem einen oder anderen Mittel zugehörigen Wurmzahlen standen, so wurden wir bei dieser Art des Versuchs gänzlich unabhängig von der Menge der Würmer, die der Kranke ursprünglich beherbergte. Wer sich dagegen nur mit einer Kur begnügt, erhält die absoluten Zahlen; diese aber richten sich ebenso nach der Art des Mittels wie nach dem Grad der Infektion, der stets eine unbekannte Grösse bleibt. Es ist von vornherein begreiflich, dass das zu grossen Täuschungen Anlass geben muss. Zum Ueberfluss hierzu ein Beispiel.

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Bei 160 Leuten, die sich ohne irgend eine Auswahl, allein der Reihenfolge nach, in der sie zum Hospital kamen, der Wurmkur unterzogen, gingen pro 100 Personen mit Tyhmol 1,601a, bei anderen 122 Leuten pro 100 Personen mit Naphthol 1,928a ab.

Darnach würde Naphthol das kräftigere Vermifugum heissen müssen! Die Doppelkur und der Wechsel der Reihenfolge gibt uns nun die Correctur: I. Bei 100 Personen gehen ab mit Thymol 1,601a; mit Naphthol noch 270a. II. Bei 100 Personen gehen ab mit Naphthol 1,928a; mit Thymol noch 1,059a. Oder prozentual, die Wirksamkeit von Thymol (Naphthol = 86 Prozent), 14 Prozent; Naphthol (Thymol = 64 Prozent), 36 Prozent.

Noch kürzer ausgedrückt kommt hiernach dem Thymol ein Wirkungscoeffizient von 86, dem Naphthol von nur 64 zu, wobei 100 die Summe der von je zwei Kuren abgegangenen Würmer bedeutet. Aus dieser Art der Wertbestimmung geht eine zweifellose Ueberlegenheit des Thymols hervor. Ebenso wie den Fehler, der von dem verschiedenen Infectionsgrad der Leute ausgeht, vermeidet man mit der von uns befolgten Methode unter anderen auch den, welchen die Infektionsart (ob Ancylostomum Dubini oder Necator americanus) bedingt.

Nach unseren Erfahrungen verhalten sich diese beiden Arten gegen die einzelnen Wurmmittel keineswegs gleichartig, sie können daher ebenfalls das Resultat beeinflussen.

Immerhin bleiben bei solchen Versuchen noch eine ganze Anzahl nebensächlicher Faktoren, die man nicht in der Hand hat, und die daher leicht Schwankungen verursachen. So gab eine zweite Serie, bei der mit Thymol-Naphthol 149, mit Naphthol-Thymol 66 Personen beteiligt waren, den Coeffizienten 89 und 74. Solche Differenzen können nur durch grosse Reihen rektifiziert werden.

Was die Feststellung des Resultates, das Auswaschen der Stühle, das Zählen der Würmer etc., anbelangt, so sei auf die oben zitierte Arbeit verwiesen.

VERABREICHUNG DER MITTEL.

1. Thymol: (*a*) Grammweise, zweistündlich, 5 mal hintereinander. Zwei Stunden nach letzter Dosis 20 gr. Ricinusöl. (*b*) Zweimal 2 gr. mit einer zweistündigen Pause; drei Stunden später 17 gr. Ricinusöl+3 gr. Chloroform. Das letztere soll noch eine Wirkung auf die vom Thymol nur halbgetroffenen Würmer ausüben. Die Mischung wurde von den Leuten fast leichter genommen als reines Ricinusöl und hatte keinerlei nachteilige Wirkung.

2. Oleum eucalypti in der von Hermann empfohlenen Mischung: Ol. eucal., 2.5–3.5; Chloroform, 3.5; Ol. ricini, 40. S. In zwei Portionen mit halbstündiger Pause zu nehmen.

3. Beta-Naphthol, zweistündlich dreimal je ein Gramm; eine Stunde nach letzter Dosis 20 gr. Ricinusöl.

4. Ol. chenopodii anthelmintici, zweistündlich dreimal hintereinander je 16 Tropfen mit Zucker. Zwei Stunden nach letzter Dosis 17 gr. Ricinusöl+3 gr. Chloroform.

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Wir erhielten nun folgende Serien:

[In den Tabellen bedeutet a = Ancylostomum, A = Ascaris.]

Nummer.	Zahl der Leute.	Erste Kur.			Zweite Kur.		
		Wurmmittel.	Abgegangene—		Wurmmittel.	Abgegangene—	
			a	A		a	A
I	153	Thymol	3,706	434	Thymol	765	127
II	165	do	4,808	162	Ol. eucal	774	8
III	354	Ol. eucal	4,315	39	Thymol	7,116	321
IV	309	Thymol	8,449	652	Naphthol	1,147	15
V	188	Naphthol	3,462	70	Thymol	1,641	316
VI	142	Thymol	4,154	155	Ol. chenop	751	45
VII	146	Ol. chenop	8,022	244	Thymol	820	37

Aus diesen Grundzahlen lassen sich die folgenden Verhältniswerte ziehen:

	Prozent.
A. Für die Ancylostomen die Wirksamkeit von—	
Thymol (Thymol=83 Prozent)	17
Thymol (Ol. Eucal.=86 Prozent)	14
Thymol (Naphthol=88 Prozent)	12
Thymol (Ol. Chen.=85 Prozent)	15
Ol. Eucal. (Thymol=38 Prozent)	62
Naphthol (Thymol=68 Prozent)	32
Ol. chenop. (Thymol=91 Prozent)	9
B. Für die Ascariden die Wirksamkeit von—	
Thymol=78 Prozent)	22
Thymol (Ol. Eucal.=95 Prozent)	5
Thymol (Naphthol=98 Prozent)	2
Thymol (Ol. chen.=78 Prozent)	22
Ol. Eucal. (Thymol=12 Prozent)	88
Naphthol (Thymol=18 Prozent)	82
Ol. chen. (Thymol=87 Prozent)	13

Kurz ausgedrückt ist der Wirkungscoeffizient gegen:

Ancylostomum.	Prozent.	*Ascariden.*	Prozent.
Ol. eucal	38	Ol. eucal	12
Naphthol	68	Naphthol	18
Thymol	83	Thymol	78
Ol. chenop	91	Ol. chenop	87

Aus den vorstehenden Tabellen sehen wir zunächst, dass tatsächlich das Thymol dem Ol. eucalypti und dem Naphthol den Rang abläuft, Bemerkenswert ist ferner die grosse Regelmässigkeit, die es an erster Stelle gegeben entwickelt. Dieses Verhältnis verschiebt sich auch kaum, wenn Thymol auf Thymol genommen wurde; Thymol steht dann mit den übrigen an zweiter Stelle verabreichten Mitteln fast auf einer Stufe. Man erhält daher bei dieser Reihenfolge keine rechte Einsicht in die jeweiligen Kräfte.

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Die grossen Unterschiede zeigen sich erst, wenn die zu prüfenden Mittel dem Thymol vorangestellt werden. Jetzt fällt das Ol. eucalypti mit nur 38, das Naphthol mit nur 68 gegen das Thymol mit seinem Coeffizienten 83 ab, dieses aber wird durch das Oleum chenopodii mit der Ziffer 91 merklich übertroffen.

Dem Oleum chenopodii kommt nach diesen Versuchen die meiste vermifuge Energie zu. Was uns daran besonders wichtig erscheint, ist, dass es sich gleich kräftig gegen die Ancylostomen wie gegen die Ascariden äussert, und zwar aus zwei Gründen. Einmal haben die Ascariden in den Tropen durch ihre so riesige Verbreitung längst ihren harmlosen Charakter verloren, so dass Mittel, die möglichst beide Parasiten treffen, nötig sind. Und dann knüpft sich an das Abgehen der Ascariden ein erziehliches Moment. Während nämlich das kleine Ancylostomum meist übersehen und darum leicht unterschätzt wird, macht der grosse Ascaris, der sich in den Entleerungen findet, immer Eindruck und trägt dazu bei, den Leuten die Notwendigkeit der Kur zum Bewusstsein zu bringen. Wir haben auf diese Nebenwirkung, die ja das Thymol auch besitzt, in Deli von jeher grossen Wert gelegt und halten aus diesem Grunde das Ol. eucalypti und das Naphthol, die gegen den Ascaris nichts nennenswertes ausrichten, für Mittel, die in den Tropen nur ganz untergeordnete Bedeutung haben können.

Neben einer prompten Wirksamkeit soll ein Wurmmittel auch leicht einzunehmen sein. Der Mangel an dieser Eigenschaft hat dem Thymol soviel geschadet und seiner allgemeinen Einführung entgegengestanden. Das Oleum chenopodii nun erfüllt die Forderung in mustergiltiger Weise. Auf Zucker gegeben, nahmen es unsere Leute gern, und sie würden sich geradezu zur Kur gedrängt haben, wenn nicht zum Schluss das Ricinusöl zu schlucken gewesen wäre. Nun, unbedingt nötig ist ja das Öl zur Kur nicht, es erleichtert nur die Stuhlkontrolle, die sich sonst über Tage hinzieht. Man könnte es darum vielleicht weglassen, oder nach einem besser schmeckenden Ersatz suchen. Verbesserungsfähig ist die Kur jedenfalls noch.

Ein Nachteil haftet dem *Ol.* chenopodii allerdings noch an, sein hoher Preis!! Jetzt kostet das Kilo noch mindestens 70 Mark in Europa, die einzelne Kur ist daher noch doppelt so teuer als eine Thymol-oder Eucalyptus-Kur, und 5 mal so teuer, wie eine Naphthol-Kur, welche unter Berechnung von Engrospreisen auf etwa drei Pfennige zu stehen kommt. Um den Beruf als Volksmittel im eigentlichsten Sinne des Wortes (in Deli sind 99 Prozent der Bevölkerung infiziert, und ähnlich wird es in den meisten tropischen Ländern sein), auszufüllen, muss es billiger werden, eine Aufgabe, deren Lösung der Industrie zufällt. Allerdings soll man dabei nicht vergessen, dass ein Teil des höheren Preises sicherlich durch die

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vortrefflichen Eigenschaften des Öles, seine starke wurmtreibende Wirkung und seine leichte Einnehmbarkeit aufgehoben wird. Wir möchten es daher heute schon im Kampfe gegen das Ancylostomum angelegentlichst empfohlen haben.

[1] Brüning, H., Zur Kenntnis des amerikanischen Wurmsamenöles. Z. f. exper Pathologie u. Therapie, 1906.

[2] Brüning, H., Zur Frage der Helminthiasis in den Tropen. Arch. f. Schiffs- u. Tropenhygiene, 1910, S. 733.

[3] Schüffner, Der Wert einiger Vermifuga. Arch. f. Tropenhyg., 1912.

CONTROL AND ERADICATION OF HOOKWORM DISEASE.

Maj. Bailey K. Ashford, United States Army.

The control of uncinariasis depends upon the education of the people, upon cultivating an interest in eradicating it. This education should be largely accomplished by object lessons, and when once a considerable part of the public is really convinced of the necessity for its control and eradication, sanitary surveillance and even disciplinary measures should be applied to those who persistently menace the public health against the will and to the prejudice of the interests of an enlightened people.

Thus, education by the written and spoken word, by successful treatment of the sick, by sanitary inspection of homes, and by punitive measures for willful defiance of cardinal principles of prophylaxis embraces practically all that we need to control and, ultimately, even to eradicate uncinariasis.

But while all of these measures are essentially educational, no one of them can compare in point of efficiency with the public dispensary for the diagnosis and treatment of those sick from the disease. Few, indeed, are the serious diseases which can be cured by a specific drug, and uncinariasis is one of them. It is incredible that one should hesitate to apply so powerful an argument to an incredulous public, for in the mind of the average layman "the proof of the pudding is in the eating." That proof comes to most people when they have the spoon in their own mouths or they see it in the mouth of their friends.

I spent about three years, from 1899 to 1902, preaching that the anemia of Porto Rico was uncinariasis. I published articles in English and Spanish medical journals, and even wrote popular articles for the public press in Porto Rico throughout those three years without visibly affecting the situation. The majority of those who read the popular articles thought that this was a more or less ingenious way of attracting attention to a condition for which there had always been a better explanation. Many of the medical profession who read the technical articles studied up whatever their favorite textbook happened to say on the subject of "ankylostomiasis,'

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which in 99 per cent of instances was precious little, and smilingly admitted that this disease was known in Europe as "miner's anemia," but that in Porto Rico, while it was very interesting to know that the worm existed in the island, everyone knew that a vegetable and codfish diet, a tropical climate, and malaria were perfectly satisfactory explanations for the pallor of the country laborer.

I suspect that there have been at least three stages in the development of every campaign against uncinariasis the world over:

1. *The facetious period,* when funny papers have their fling and people are apt to insinuate that the "lazy bug" might not be a stranger to certain of their otherwise healthy-looking acquaintances.

2. *The troubulous, contentious, argumentative period,* when "starvation is being explained away by a germ," or, "another pretext has been found for harassing the southern people," or, "capital has discovered another means of persecuting the poor laborer."

3. *The period in which eyes are opened and the truth is accepted.*

Now, to me, all of this is simply natural. Although I do not know from personal experience what public and professional opinion was in the United States, and especially in the South, where the disease has for years made such sad havoc, when Dr. Charles Wardell Stiles "held up this fiery serpent" to public gaze, I do distinctly remember how it comforted me and my comrades, just emerging from stage 2, to see reflected in the continental press others in the throes of stage No. 1. It comforted us because we knew that stages 2 and 3 would follow the discovery by our eminent American zoologist that the curse of the South of the United States was uncinariasis, especially as that zoologist is of the practical sort that is not satisfied merely to differentiate a new species, but proceeds to annihilate the species he brings into being.

I, myself, before I determined the parasitic cause of the anemia of Porto Rico, spent a month or so vigorously plying over 200 unfortunates with a food yielding from 4,000 to 4,500 calories, under the impression that their anemia resulted from chronic starvation, and thereby set up some violent intestinal disorders with my very best intention.

It was not that either people or their doctors were lacking in intelligence nor blinded by prejudice. They simply could not accept what was for them a theory for what they conceived to be facts. When they saw their severe anemia cured in a month or so by thymol that theory became a fact and the previous "facts" became discredited or were relegated to a position of secondary importance.

I hold that no people has more promptly accepted these, nor more reasonably nor with less prejudice.

So while I believe that pamphlets and speeches have their place in a campaign against the disease, such methods alone are likely to be dismal failures.

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THE DEVELOPMENT OF THE "ANEMIA DISPENSARY" IN PORTO RICO.

In 1902, after a conference with Dr. Walter W. King, of the Public Health Service, I decided to request of the director of the large civil hospital Tricoche, in Ponce, that a ward of some 20 patients be set aside for us in order that we might study and treat advanced cases of uncinariasis. We made it a rule to take into that ward only such cases as were considered hopeless by the hospital staff, hence our high mortality, 10 per cent. The results were enthusiastically hailed in the hospital, however, as such severe cases usually died, and thus a small coterie of physicians were convinced of the nature of Porto Rican anemia. A summary of our work subsequently reached ex-Gov. Régis H. Post, then secretary for Porto Rico, who, becoming interested in the matter, in turn interested the legislature in passing a law authorizing the expenditure of $5,000 for the study and treatment of the disease. We were designated, with Dr. Pedro Gutierrez, a commission of three to discharge this duty.

We had learned our first lesson, however, not to talk or write at large about "germs," but to open a dispensary, convert the sick individually to our way of thinking by curing them up and let them do the talking for us. We combined with this dispensary a field hospital and filled it with the most extreme cases we could find. In fact, in Utuado we prevailed upon the mayor to arrange to have brought to the hospital two of the most serious and notorious cases of anemia from each of the 25 barrios of which that large municipality was composed. With few exceptions, all returned to their homes as soon as we could get them out with the story to tell that their food in our hospital had not differed materially from that they were used to having at home but that by virtue of some exceedingly bad medicine they had regained their health.

When it is remembered that the life of every one of these people was despaired of when they were sent to us, that practically all arrived in hammocks and returned on foot, and that their disease had lasted so long a time that their friends had never known them save as anemics, the sudden appearance of these quondam specters, now for the most part hearty and robust men and women, in the barrios from which they had departed to "die in hospital" created a tremendous sensation. The effect of this was what might naturally be expected: From these barrios came ever-increasing numbers of expectant men, women, and children, young and old, light, moderate, and intense cases, generally afoot, sometimes on horseback, sometimes in hammocks swung on poles; many would have to travel all night over mountain paths, and all would patiently wait, each with his little box of feces, or with this indispensable article wrapped

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in a banana leaf, from 5 a. m. to 5 p. m., if needs be, "to get examined" and "get his medicine." It should be added that although this trip to the dispensary generally meant the loss of one or two meals for that day and a long and weary trudge in the bargain, the majority returned promptly at the end of a week for more medicine and continued to return weekly until they were pronounced cured.

We were in Utuado but three months, or as long as our money held out. Had we been there a year we would have certainly treated three-quarters of the entire population of 40,000.

These country clinics, at which the nature of the anemia was explained, each case carefully diagnosed, a specific remedy given, and the essential measures of prophylaxis enunciated in simple language, so thoroughly drummed the elemental facts into these simple country folk that it would have been a sacrilege to have applied at that time any law which would have exerted further pressure upon them.

In view, therefore, of our personal experience, we naturally felt that we should make the dispensary our working unit and the treatment of anemics our slogan in the campaign into which we were entering, and bide our time for soil-pollution laws and sanitary inspection of houses. And this has been our campaign from March 6, 1904, to June 30, 1911, each year repeating the history of the year before with interest, the same crowds, the same good will, the same sensational cures, but into the work of each successive year has been injected more and more inspection of homes, more and more control over the disposal of feces, and more and more cooperation with the family and the plantation to secure hygienic living.

Town after town received the commission's dispensary, but usually only after their doctors had spent with us a long enough time to familiarize them with our technique and bind them to our plan. When the town's own doctor—and he was never too old—caught the fever, he rolled in statistics of cases treated monthly that would have been hardly credible had we not known from frequent inspections and from the uniformity of his varied data, compared with that of others and our own, that he was really discharging his duty.

The work was so well in hand by the end of the second year that Dr. Gutierrez consented to take charge of it as its director, the other two members for the year following, and one member until the last, cooperating unofficially with him. His magnificent results bear eloquent witness to his steadfastness to a plan which was based upon the most democratic of principles and to the spirit and perseverance of the Porto Rican physicians who manned his 35 to 59 dispensaries.

Thus we secured the voluntary cooperation of all the people and preserved throughout these years our character as physicians,

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although little by little we were unfolding our plan as sanitarians. They came to look upon the "anemia dispensaries" as the natural place to go when they were sick, and they spread every detail of our talks on prophylaxis over every acre of land in Porto Rico. In fact, the educational value of the dispensary was so generally recognized that the name of the Anemia Service was changed by law to Tropical and Transmissible Diseases Service in 1909 and the director was charged to foster "measures tending to prevent the tropical and transmissible in this island."

What has been the result? The total death rate immediately began to fall and kept on falling until it reached a half, or even, in some coffee sections, less than a half of what it had been; as time went by severe anemia became less and less prominent, until to-day many people say that anemia has almost disappeared. This, while not strictly true, is true to the extent that instead of having 560,000 people more or less affected by uncinariasis, 50 per cent of whom were moderate and 30 per cent intense cases, we calculate that Porto Rico has to-day not over 100,000 such cases, of whom 90 per cent are moderate in intensity, and this number is thus still large simply because these cases are for the most part in barrios too remote from any dispensary heretofore established to enable them to reach it with any degree of ease. That reinfections occur we do not doubt, but that they are as frequent and as severe as heretofore is certainly not true.

So now is the time, when the back of the mortality is broken, when the sick from uncinariasis are but a fifth of what they used to be, and when the whole people is thoroughly convinced of the necessity for more stringent measures to eradicate the disease, that we can turn our preferent attention to the inspection of rural homes and to legislation which will tend to diminish soil pollution and glaring offenses against sanitary living.

These are the reasons for our belief that the rational sequence of methods in conducting an antiuncinariasis campaign should begin with the universal treatment of the sick, together with education of the individual. Later on, more and more attention should be paid to the education of the people in general, and, last of all, to these measures should be added inspection of homes and soil-pollution laws. In developing my thesis I have taken the liberty of giving our own experience, although in so doing I have had to dwell upon facts already expressed in previous reports and papers emanating from one or more of the Porto Rico Anemia Commission.

On the 30th of June, 1911, the special service created to combat uncinariasis ceased to exist, and the work passed over to the new sanitary organization for the island. The truth of the matter is, however, that we ourselves feel that this special service was

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modified too soon. It should be kept up as a thing apart with all of its previous organization until the morbidity from anemia has been still further reduced, for 100,000 cases of evident anemia demonstrates a serious state of affairs still. The sanitary service, whose director has been actively interested in the work of the commission from its infancy, not having special funds at its disposal, and thoroughly in harmony with our conception of the importance of sustaining this work, intrusted the continuance of the former dispensaries to its health officers and carried out our last recommendation, when we relinquished control over our service, by creating two ambulant working parties for the purpose of carrying medicines, microscopes, literature, and professional personnel to those who are out of touch with the health officer's dispensary. These parties go to one large plantation after another in remote barrios, interest the planter, and cure up his anemic laborers. The pity of it is that there are not more such parties and that the overworked health officer has to take care of the dispensary down in the town, in addition to many other duties. Could a special service handle dispensary and working parties in the field and have at its disposition its own force of inspectors, with laws behind it to prohibit soil pollution and insanitary closets, we would soon get rid of not only a source of considerable morbidity and even mortality from uncinariasis, but from typhoid, the dysenteries, bilharziosis, and other diseases as well. As a matter of fact, there actually is a bureau of transmissible diseases in the present sanitary service, but they certainly can not carry out the intensive campaign needed with the funds available.

We realize that the blow uncinariasis in Porto Rico received from our six years' campaign will probably prevent that disease from ever causing over 25 per cent of the damage it formerly caused, but it is sad to reflect that it might remain at that 25 per cent, which would mean the chronic invaliding of 200,000 people, with their corresponding proportion of deaths.

The worst of the present situation is that the resources of the island are being strained tremenduously to meet the necessities of general sanitation and, lately, a special emergency in the shape of bubonic plague, a few cases of which have appeared for the first time in the history of the island, has suddenly presented itself with all of the heavy expense it entails.

To combat uncinariasis it is necessary to agree upon the most usual mode of infection.

In combating uncinariasis, as in the case of every transmissible disease, success depends upon simplicity and uniformity of prophylaxis. Right at the threshold of our educational campaign we are confronted with the question: How is man infected by hookworm?

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While it is interesting to know that experimenters have infected dogs by causing them to swallow the larvæ, we are entirely convinced that if skin infection be prevented the disease will not be acquired. I mention this matter because, although the American and many of the English workers have seemed to have accepted this as at least the chief route of infection, there appears to be some divergence from this view on the continent of Europe.

Ground itch, or "mazamorra," is followed by uncinariasis in Porto Rico, and those found infected who do not give a history of having suffered from this dermatitis are very few indeed. We are now speaking of our general observation in 300,000 cases.

To be more explicit: Of 4,741 persons questioned by the commission at our own dispensary in 1904, over 98 per cent stated that they had suffered from mazamorra and our individual clinical histories demonstrated that whenever these attacks were at all severe the anemia either came on for the first time or, if already present, the patient became acutely worse. In addition to this, the mazamorra of Porto Rico is severest in the coffee groves, where the major part of the anemia is found, and the season of its greatest severity is the period of rains, or the coffee-picking season. These facts, together with the unconscious corroboration of our belief by the peasant himself, who declares that walking barefooted in the mud is the cause of his anemia, seems abundant reason for our conviction. A large percentage of town dwellers obtain their drinking water from brooks flowing through heavily infected coffee plantations. Many drink their water unfiltered, but never have ova of necator in their stools, and only when they suffer an accidental infection through the skin do these ova appear.

In 1905 we questioned 18,445 of our 18,865 patients on this point. Of these, 11,660 stated that they acquired mazamorra in the coffee groves; 2,263 declared that they received it in the immediate environment of their homes; 2,201 from roads and paths, chiefly those winding through coffee plantations; 1,305 from fields, pastures, banana patches, etc., and from the neighborhood of rivers, streams, and pools of water; 178 from town streets and the surroundings of schools; and only 47 from tobacco and sugar plantations. Seven hundred and ninety-one denied having had mazamorra, but the great majority of these were light or very light cases whose infections were correspondingly light and hence probably long since forgotten.

That is to say, of this series 95.7 per cent acknowledged having had mazamorra; fully 90 per cent of these stated that they were plagued by it every year, during the rainy season, as a rule; 63 per cent definitely blamed the coffee grove itself for their dermatitis; but only when we add to this number those who claim to have acquired it in paths near streams and in the vicinity of their huts can we appre-

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ciate what a dangerous spot a coffee plantation can be. True, we were working in coffee-growing municipalities, but some of our patients were engaged in tobacco and sugar culture, notably in Aibonito, Comerio, and Guayama. One of the barrios of Aibonito, La Plata, dedicated almost entirely to tobacco culture by the Porto Rican American Tobacco Co., contributed 565 patients to our dispensary in 1905. These laborers had come down from the coffee groves to work in tobacco fields, yet even with these only 19 of over a total of 18,000 infected blamed tobacco estates for their mazamorra.

To this array of epidemiologic observation let us add the incontrovertible experimental evidence afforded us by Looss, who first demonstrated that hookworm infection can occur through the penetration of the skin by the larvæ and the logical deduction is that this is the route usually taken by the parasite.

But a curious accident of infection had escaped us. Of the 87 persons in the first series and 791 in the second, who denied having had mazamorra, there was a considerable number who wore shoes. Among these people were found those of the better class who scorned having had any disease of the feet. Such persons when pressed for an answer said that they had suffered from eczema of the toes, but that it came from sweating of the feet as they wore shoes. We accepted this explanation, but now, in view of what is to follow, we must conceive that many of these had really contracted mazamorra, even in spite of their shoes.

In January of 1910 a practice march of 10 days and in February of the same year one of 5 days was made by a battalion of the Porto Rican Regiment of Infantry. There were approximately 250 men on these marches and from them 55 returned with typical ground itch, the majority from the second march. All were immediately subjected to fecal examination and 33 were found to have been already infected at some unknown time previous, as they contained ova of Necator Americanus in their stools. These were discarded from the study series and placed under treatment, and the 22 who had no ova in their feces and who, therefore, had received their first infection, were closely watched for the appearance of eggs. Two of these men never developed them but all of the rest did, at first gradually and soon abundantly. As I did not know the precise day upon which they were infected and could examine their stools only every 7 to 10 days I had to calculate the possible incubation period as follows:

Five men developed ova in from 35 to 50 days after their mazamorra, 6 in from 44 to 58 days, 6 in from 55 to 69 days, 2 in from 74 to 94 days, and 1 in from 63 to 82 days.

Not only this but many felt definitely sick and an eosinophilia was demonstrated in a differential count of the blood.

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The details of this infection are interesting: All but 1 of the 20 in whom ova developed acquired their ground itch in the February march, which was a special one for maneuver purposes conducted by the colonel for Gen. Grant, who was at the time inspecting the regiment. There were two companies in each of which only one man was infected. Our soldiers here are usually very chary of raw water. This is persistently ground into them, but on this occasion they were naturally still more particular not to disobey the strict orders they had received.

There is one matter about which little question can be raised: They wore their shoes and leggings all of the time save when they retired for the night. In the course of the field exercises the troops were obliged to cross muddy lowlands and slippery trails. It rained hard and all the men who suffered from the dermatitis stated positively that they had acquired it with their shoes on and from these muddy sections. I personally examined their feet after the march and all were typical cases of mazamorra. Anyone who knows the Army shoe and legging can realize that no better protection for the average man could be desired, unless, of course, it be boots.

What happened was that the muddy water flowed over the tops of their shoes, between these and their leggings, and the larvæ thus reached the skin. In view of these facts, we are driven to conclude that to compel the poor jibaro to buy shoes would seem unjust. Not that shoes are not a great protection, nor that we should hesitate to prescribe them as a means of reducing the chances for infection, but we must not attempt to force a measure which at present might not justify the vast inconvenience and expense it would occasion many people who might do better in building a sanitary privy with the same money.

A campaign against uncinariasis should comprehend:

1. *Individual hygiene.*—(*a*) Treatment of carriers: To treat all carriers, willy-nilly, is to affront a grave problem, graver, perhaps, than the good we could hope to get out of it. The preceding remarks show us what an immense number of people come voluntarily under treatment; to exact their attendance at these dispensaries or to forcibly inflict thymol upon them would precipitate among the most docile people in the world a small revolution. We might by force do it, but at what a cost.

On the other hand, nearly one-third of the total population of the island has voluntarily placed themselves in our hands by methods above described. So much for Government initiative and for official records. Exactly how many more have officially received treatment no one can ever know, although we have hazarded a guess. This work has been done without a single punitive measure. No one feels aggrieved at a "paternal government," and there is not a voice raised

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in Porto Rico against our work. On the contrary, everyone is clamoring to have it continued.

Our practical experience is that groves where the majority of infected have been treated have lost a great deal in infectivity. Were we to acknowledge a free-life stage for hookworm it would be a different story, but we do not. Hookworms do not enjoy a free-life stage, and one egg means but one larva. The problem is, therefore, much simpler, and the universal cure of sick means a tremendous decrease in the infectivity of the soil.

But we have gone a good way in our crusade against uncinariasis in Porto Rico, and it is now high time to make some regulations. We can and should prohibit work to coffee workers until they bring a certificate from the anemia dispensary that they are free from hookworm eggs. We can apply the same rule to all estates, whether of sugar, tobacco, or fruit, if we want to strain a point, which from present indications I hardly think necessary. We should certainly apply it to all mines, brickworks, tunnels, and road building; in fact, it might be applied to all of those industries and enterprises which employ more than 25 laborers who are obliged to come into direct contact with earth in their daily work. If we decide to make such laws, however, we should provide as perfect a special service as it is possible to make.

I would hesitate to apply such a regulation to all school children for the simple reason that their digestive organs, in the Tropics, are easily upset, and unless they are in real need of treatment it would be too much to require that everyone bearing ova of hookworm should be sterilized of the same before being permitted to continue their course of study. I do believe that in the medical inspection of schools, if children are found who are really sick from uncinariasis, or if such children are being retarded in their studies, in the opinion of the medical inspector, by uncinarial infection, they should be prohibited from returning until this certificate be furnished them by competent authority.

(*b*) Treatment of the sick from uncinariasis: This has been sufficiently discussed in the body of this paper.

(*c*) Proper covering of the feet: This has also been discussed. Shoes should not be required by law, as was once done in Venezuela for a very different reason, but every effort should be made to shoe the people. Planters should be induced to make it easy and cheap to thus protect to an extent their own force of laborers. There is a planter in Yauco who employs a large number of laborers and who has provided them all with shoes at his own expense as a result of this campaign. He states that he has never made a better outlay of money, for his peons have remained cured and the resulting increase in efficiency has repaid him manyfold for his original expendi-

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ture. The providing of shoes for the poor should receive the attention of educationalists and philanthropists.

(*d*) Prevention of soil pollution: This is a tremendously important matter. After due education of the public it should be made a misdemeanor to dispose of feces in any other way save that permitted by law. This should be the final blow struck against uncinariasis, and if we ever reach the point where it will be possible to make such a law, and in such a way as to preclude the possibility of an unwarrantable infringement upon the liberties of the individual, we shall have conquered uncinariasis, and several other deadly diseases to boot. The time has decidedly arrived when some just law covering this terrible danger to human life be drafted. It will have to come some day and it might just as well come now.

2. *Sanitation of the dwelling.*—(*a*) Fixed privies: These should be exacted of everyone. There are many models for rural districts, but those devised by Lumsdon and Stiles seem to be excellent. The great question is the expense. An immense amount of work has been done in this direction in Porto Rico, but the difficulty is not to build the privy, but to build it right. And to build a sanitary privy costs more than the "jibaro" has to spend. A jibaro hut costs approximately $20 or rather, it may be valued at that figure. Almost any privy that would satisfy the necessities of modern sanitation would cost from $10 to $30, in the mountains of Porto Rico, especially, where everything has to be hauled at a great cost. I think the law itself would have a hard time to demand of a citizen a privy that would cost more than his house. Much might be done through the planter, for it is economical for the proprietor of a large estate to have his own laborers live with him and under his own sanitary vigilance. Better homes for these poor people is not too much to ask and the privy ought to go along with it.

(*b*) Adequate drainage of the site upon which the dwelling rests: In Porto Rico this is fairly well attended to. The people have a well-defined fear of damp spots and the surroundings of a house are generally of beaten clay, with little runs for water. But where the drainage is poor it should be corrected by sanitary authority.

(*c*) Shade and excess of low-growing shrubbery: This is common in Porto Rico. It is said that a jibaro hut is hidden among the trees to be out of sight of officers of the law who have at times in history imposed upon them. Even though immediate surroundings of the hut are of hard clay, the shade encourages the very dampness he seeks to avoid and at a very short distance is a dense tropical growth inviting promiscous soil pollution.

3. *Sanitation of the place of work.*—This is a problem with which I believe we must grapple immediately; first, because it seems to be

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evident that where the workers gather, especially in the coffee groves, is where the greatest danger lies; and second, because it is manifestly righteous that if the planter is to secure the benefit of the work of his laborers who are helpless in his own plantation against infection, he should be compelled to provide them means for their own protection. Not only should he be obliged to do this, but he should be encouraged to cooperate with the sanitary authorities in bringing to justice persistent offenders against the soil-pollution law, above recommended.

(*a*) Movable privies: The model adopted by the Army in the maneuver camp at the Mexican border in 1911, and known as the Straub latrine, devised by Maj. Straub of the Army Medical Corps, is highly recommended. This is a cheap, efficient, and sanitary model. Its principle is that of a trench with box seat excluding flies, and a daily sterilization by fire fed with oil.

(*b*) Drainage of marshy ground: In certain plantations this should be required and is a measure which is not without its monetary value to the landowner.

THE ORGANIZATION OF A CAMPAIGN AGAINST UNCINARIASIS.

In conclusion, the organization of a campaign against uncinariasis should be in the hands of a special service, under the health department, until the disease is well under control. Thereafter it can be intrusted to the ordinary routine of every health officer's duty. Complete eradication of the disease, when generalized in tropical countries, can hardly be expected, and control of the endemic comes only after the expenditure of much money and after the united effort of the whole people.

A special service should comprise factors:

1. *A dispensary service.*—(*a*) in fixed places, such as towns, for those who voluntarily seek treatment; (*b*) an ambulant service for remote country districts, hamlets, and large agricultural estates.

2. *Service of sanitary police and inspectors with powers of police.*—(*a*) For the enforcement of laws pertaining to soil pollution; inspection of privies; (*b*) for enforcement of proper drainage in vicinity of homes; (*c*) for the instruction of the members of the household in the essentials of prophylaxis and for the distribution of literature on uncinariasis; (*d*) for the placarding of houses advising the inmates of means of prophylaxis (this and the preceding measure were extensively utilized by Dr. Gutierrez); (*e*) for the prevention of employment of carriers on large estates and in Government work.

3. *Special educational measures.*—(*a*) Teaching of prophylaxis in schools: This has at last been partially secured in Porto Rico. As

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Deck and Bass picturesquely remark in their excellent work on hookworm disease:

> It is a reflection on the common sense of the country that we have for years been spending time and money teaching school children the evil effects of alcohol, tobacco, pork, and coffee, while the children were in many instances being killed by hookworms before they were tempted to drink whisky or even to smoke.

To-day the evil effect of insanitary living as applied to uncinariasis is being taught in at least some of the rural schools, as Mr. Rose, the administrative secretary of the Rockefeller Sanitary Commission, saw in a tour with me recently through the interior of the island. It is entirely unnecessary to comment on the enormous value of this measure; any country afflicted with uncinariasis that leaves such instruction out of its curriculum is failing in a patriotic duty.

(*b*) popular lectures; (*c*) pamphlets, placards, etc.; (*d*) press agencies; (*e*) enlistment of the aid of all physicians in treating and reporting cases.

DISTRIBUTION OF THE HOOKWORM DISEASE.

Dr. W. S. RANKIN, secretary State Board of Health, Raleigh, N. C., and Dr. HIRAM BYRD, State Board of Health, Jacksonville, Fla.

That hookworm disease is more prevalent in some parts of the country than others is not due to an unequal distribution of virtues, however unequally virtues may be distributed. If the prevalence of this parasite depended solely upon the habits of the people, or if its spread over the earth had been checked only by the intelligent effort directed against it, uncinariasis would be as prevalent to-day in one part of the world as another; there would be as many pale faces in England as in India, as many in the regions of the Great Lakes as in the Mississippi Valley. That such is not the case is due to the fact that the spread of the disease has been checked without any effort on the part of the people to check it, checked without human effort, and even without human knowledge. For it is the nature of the hookworm, as of every other living thing, whether animal or plant, whether high or low, to distribute itself far and wide, to distribute itself in every direction possible; to travel fast where the road is easy, more slowly where rough, but to halt only in the presence of an impassable barrier.

Where the hookworm finds its optimum environments—that is, sufficient warmth and not too much, sufficient moisture and not too much—in fine, where it finds sufficiency of everything it needs and too much of none of it, there it is, as the hookworm would say, most prosperous; as we say, most prevalent; or as biologists say, that is the center of distribution.

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From the center of distribution it spreads out in all possible directions, in widening and ever-widening circles, till it encounters some impassable barrier, some unfavorable environment, beyond which it can not go. This center of distribution may be a small area or it may be a large one, for it includes all the territory where the species finds optimum conditions of existence.

At the center of distribution there the greatest numbers will be found, but passing away from this center in any direction they will become progressively fewer and fewer, sometimes abruptly terminating, as when land species reach the water; sometimes gradually, as when beaten back by a gradually changing temperature, or a gradually diminishing food supply. At the center of distribution production surpasses destruction, but toward the periphery destruction is in excess of production.

Now, an imaginary contour line may be drawn around the center of distribution at a point where production and destruction are exactly equal. The area within this circle is the area of productive distribution, while the area without it is the area of nominal distribution.

Except in mines, as in Pennsylvania, Cornwall, and Germany, the area of productive distribution of the hookworm is limited to the tropical and subtropical countries—in the United States, chiefly to the river valleys of the South Atlantic and Gulf States. This is particularly true near the coast. Here the temperature is mild, the rainfall heavy, the soil fertile, which leads to agricultural pursuits, thus bringing the people and the earth close together. It is here that the hookworm would boast of its greatest prosperity—not the adult hookworm, for that can live anywhere that its host can, but the baby hookworm that has to hatch in the open and take its chances with rain and shine, cold and heat, starvation and accident, until death overtakes it or fortune brings it and its human victims together.

Passing up these streams gradually but perceptibly, a number of changes are simultaneously encountered—the rainfall is diminished from 54 inches at the mouth of the Chattahoochee, it falls to less than half that 200 miles above; the altitude changes, and with it the temperature; the soil, instead of being loose and porous, becomes harder and stiffer clays—changes each of which is relatively insignificant in itself, but the aggregate of which presents a set of barriers against the complete prosperity of the hookworm harder and harder to be overcome, and with this series of changes the hookworm is found to be fewer and fewer.

The area of reproductive distribution corresponds with a fair degree of accuracy with the lower austral life zone as defined by C. Hart Merriam, of the United States Biological Survey. The northern border of the zone is defined by the isotherm determined as follows:

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Take the mean daily temperature above 6° C. or 43 ° F. of any place, as Nashville, say, and add them together for an entire year. If it total 10,000 Centigrade, or 18,000 Fahrenheit it marks the isotherm in question. This zone extends far enough north to include the northern neck of Virginia, then the northern border of it takes a southeasterly direction between the Appalachian Mountains and the coast, a little nearer the mountains, crossing Virginia, North Carolina, and South Carolina, dips down into Georgia, then swings westerly around the mountains, crosses a corner of Alabama, and as the Mississippi River is approached swings farther and farther north, taking a northwesterly direction across west Tennessee, then turns sharply north including in rapid succession a corner of Kentucky, Illinois, and Missouri; again turns south into Arkansas, and again north along the Arkansas Valley into southeast Kansas, and includes the eastern half of Texas.

It will be observed that in a general way it follows the thirty-fifth parallel, jutting north of this parallel on the coast and in the valleys of the Mississippi and Arkansas Rivers, and dipping south of it where the Appalachian Mountains extend down. It will also be seen at a glance that the lower austral zone includes some little spots in the Sacramento and Colorado River Valleys. These, too, are within the area of productive distribution.

Remembering that the transition from the area of productiveness to the area of nominal distribution is very gradual, and that the area of productive distribution only approximately coincides with the lower austral zone, it will at once be apparent that the territory bordering on the lower austral zone is considerably infected, and in certain favored places the infection may be even spread to a limited extent. For example, it is inconceivable that there could be so much infection on one side of the James River as is found in Virginia and a similar condition not prevail on the Maryland side, although, perhaps for lack of assiduous search, it has not been found there.

As to the intensity of the infection, it can only be observed that that varies anywhere between zero and 80 or 90 per cent, probably reaching both extremes in the lower austral zone. From 6 months old, which is the youngest case yet reported, it is increasingly prevalent up to 10 or 12 years old, maintains its maximum to about 18, and then subsides to 30 or 35, after which it is more or less rare, but may be found occasionally even in the aged.

No race seems to be exempt, but the maximum of harm, in the United States at least, is among the Caucasians. The negro, while susceptible, is not as great a sufferer as the whites, and, while this is not in harmony with most observations, our own experience would indicate that it is less prevalent among the negroes than the whites.

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THE EFFECT OF THE DISEASE ON PUBLIC LIFE.

How shall this be measured? What is the most reliable test of the effect of a disease on the life of the social organism; that is, the sum of its individual effect, the end product of its draft on vitality?

The effect of a disease on public life, the public importance of a disease, depends upon a combination of two factors. The first factor is that of frequency of occurrence, and the second factor that of the fatality of the disease. Varicella or chicken pox is of frequent occurrence, affecting, at some time of their lives, most people, but the disease rarely if ever kills and, comparatively speaking, is unimportant; anthrax is one of the most fatal diseases, but is so extremely rare in its occurrence as to be, comparatively speaking, unimportant from the public standpoint. It is neither the frequency alone nor the fatality alone of a disease, but the combination of the two that finds its expression in the mortality of a disease that fixes the rank of a disease among the foes of public life, and, with the degree of preventability, gives it its rightful claim upon the attention of sanitarians.

In addition to making our meaning clear on this point we wish to make it comprehensive. By the mortality of a disease we mean to include not only the number of deaths per 1,000 or 100,000 of the population claimed by the disease in its own name, but also those deaths primarily due to a lowering of the vitality of a people and an increase in their susceptibility to certain terminal infections through the agency of the disease in question and that thereby becomes registered under the name of some other morbific agent.

Eight or ten years ago when the professional world was suddenly awakened to the fact that 30 or 40 per cent of southern people carried hookworms in their intestines, the frequency of the condition was so astounding as to rivet attention upon this one factor of the disease to the exclusion of that other equally important factor, its severity (intensity of infection) in the average host of the parasite. Basing our judgment on this one-sided view of the condition, and in the absence of vital statistical material on which alone a satisfactory judgment of the effect of the disease on the body politic, in sharp contradistinction to the individual body, could be reached, hookworm disease was given a position among other preventable diseases of exaggerated importance.

Within recent years the South has begun to appreciate vital statistics and in a small way to use them; the South is beginning to realize that as health, individual, or public, is a relative term, the comparative health, the health of different States, and parts of the same State can be expressed only in terms of vital statistics; people are waking up to the need of some check on health officers, some easily applied standard by which the inefficient health officer may be

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recognized and eliminated, and the rule of the survival of the fittest enforced in health work; health officers are appreciating more and more the value of vital statistics in estimating the comparative strength of their foes and in making the proper assignment of their forces against the enemy.

In 1909, North Carolina enacted a vital-statistics law requiring the registration of deaths in municipalities with a population of a thousand or more. This law has been pronounced by high authority the first practical statistics law enacted in a southern State. About one-sixth of the State's population falls within the jurisdiction of this law. Since this law was enacted three southern States have enacted good vital-statistics laws, and one of the three, Kentucky, has been admitted by the Bureau of the Census in the registration area; however, the statistics of the three States are not available as yet for study.

For the reason that vital-statistical methods of studying diseases have not heretofore been available in the South, hookworm disease, so far as I know, has never before been studied in this country from a vital-statistic standpoint, and it is only from such a point of view that the true effects of the disease on public life may be judged.

For the year 1911, 6,857 deaths were registered from the registration area of North Carolina, which includes one-sixth of the State's population, in round numbers, 372,000 people. We believe that this was at least a 90 per cent registration; you may get some idea of the completeness of the registration by the fact that the death rate was 18.4, or more than 1 per thousand higher than the highest State death rate of the registration area of the United States. Of these 6,857 deaths, in a State where the incidence of hookworm infection ranges between 30 and 40 per cent, only two certificates assigned hookworm as a cause of death. However, this disease is held by all authorities to be more important as an indirect contributor to death rates through the lowering of the vitality of a population to other causes of death than as a direct cause of death. On the 6,857 death certificates hookworm disease appears only once as the contributing cause of death. No inability of the medical profession of the State to recognize the disease can be assigned as an explanation of the above facts, as it has been shown elsewhere in official reports that most of the doctors of the State had treated the disease, and a most extensive educational campaign had been waged against the disease.

Additional light is shed on the effect of hookworm disease by an examination of its influence on certain age death rates. This disease is one of the active barefooted period of life. In the South this period lasts from the third or fourth year till the fourteenth or fifteenth year, and as the course of the disease is slow, we may disre-

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gard the influence of the disease on death rates under the fifth year. Furthermore, we shall be perfectly safe in assuming that, as the longevity of the parasite is from six to eight years and, reinfection not occurring after the tenth or fifteenth year when shoes are worn throughout the year, the disease will be without influence on the death rate beyond the fiftieth year. A still further fact that buttresses the above conclusions is that the diseases occurring between the fifth and fiftieth year, the infections, are the diseases that hookworm would predispose to and through such predisposition influence the death rate of that age period, and that the diseases contributing to death rates after 50 are not those the etiology of which may be associated with hookworms 20 or 40 years previously. Ninety to 95 per cent of the effect of hookworm disease on the death rates then will be seen on the general death rate between the fifth and fiftieth year of life. The other two age periods above mentioned are nonhookworm periods.

Percentages of total deaths in United States and North Carolina for different ages.

Disease—Ages.	North Carolina.	United States.
Under 5 years—		
74 per cent of contagions	31.2	27.0
89 per cent of diarrheas		
68 per cent of broncho-pneumonia		
Between 5 and 50—		
93 per cent of tuberculosis	33.7	31.6
83 per cent of typhoid		
62 per cent of violence		
58 per cent of pneumonia		
Over 50—		
93 per cent of arterio Sclerosis	25.6	41.3
85 per cent of apoplexy		
75 per cent of heart disease		
75 per cent of malignancy		
73 per cent of Bright's		
Unknown ages	9.5	.1
Total	100	100

Now, by using the death rate in the average registration State known to be free from hookworm disease as a control test, we obtain the data shown in the chart. This chart shows that the heaviest excess death rate in North Carolina falls in the nonhookworm age period, under 5, and that the excess death rate occurring between the fifth and fiftieth year, the age death rate subject to the influence of hookworm disease is only 2.1 per cent in excess of the same age death rate where there is no hookworm disease. As the death registration in North Carolina comes from municipalities ranging in population from 1,000 to 35,000 and investigation has shown that the disease is about two and one-half times more pronounced in the strictly rural sections of the State, and as North Carolina is about 80 per cent rural, we will multiply the 2.1 per cent excess by 2.5 per cent, which would make the excess, assuming, to be

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conservative on the side of giving hookworm disease its full value, that the whole States is rural, 4.25 per cent. The total estimated deaths occurring in the 45-year period is 13,703; 4.25 per cent of these deaths would be 582 deaths.

In making this estimate we have taken no account of two important factors other than hookworm disease that are responsible to a considerable extent for the 2.1 per cent excess death rate between the fifth and fiftieth year in this State over the average registration States. These two factors, which share with hookworm as a cause of the 582 excess deaths, are the death rate of a 33 per cent negro population and malaria, neither of which play a rôle of any importance in the death rate of the registration States used as our control. When these two factors are also considered, the deaths directly and indirectly due to hookworm disease in North Carolina are less than 500.

Compare with the 500 deaths from hookworm disease the 5,473 deaths from tuberculosis, the 3,987 deaths of children under 2 years of age from diarrheal diseases, the 1,400 deaths from typhoid fever, and the 515 deaths from malaria for the same registration area, and the relative importance of hookworm disease is indicated.

Writers have failed to distinguish the large proportion of mild cases from the small proportion of severe cases. The distinction between a condition of relatively harmless parasitism and one of pathogenesis has been lost sight of in estimating the effect of hookworm disease on public life. The effect of the disease has been assumed from its frequency alone, and its influence on death rates neglected.

THE MANAGEMENT OF THE HOOKWORM DISEASE.

Practically the only extensive, well-organized effort directed specifically against the hookworm disease is that of the Rockefeller Sanitary Commission.

This work is supported by a gift of $1,000,000 from Mr. John D. Rockefeller, and is under the direction of a board of directors appointed by the donor. The Commission began work in 1910. The work of the Commission is to be completed in five years—that is, by 1915.

The first year or 18 months of the Commission consisted principally in making infection and sanitary surveys; that is, in ascertaining, first, the percentage of people in different parts of the South who, on microscopic examination of their stools, showed the ova of the parasite; and, second, in ascertaining the arrangement for the disposal of night soil at the homes of the people in different sections of the South. These surveys showed that between 30 and 40 per cent of southern people carried the parasite in their intestines, and that about one-half of southern homes were without any kind of privies whatever.

Within the last year or 18 months the character of the work has changed, and may be described under the subject of hookworm dispensaries.

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The dispensary is secured by one of the men employed in the work visiting a county, securing the indorsement of the county superintendent of health, the county board of health, the county superintendent of schools, the county school board, and of every practicing physician in the county, and with these indorsements securing from the board of county commissioners a grant of from $200 to $300 with which to pay for the drugs, the traveling expenses of a microscopist and a certain amount of publicity work necessary to bring the people to the dispensary. Some two or three weeks preceding the opening of the dispensary a page or so of the weekly county paper is used in giving publicity to the dispensary idea. Pictures of parasites and patients, before and after treatment, are shown, the disease is described in untechnical terms, and the dates and places of the dispensary service announced. Suitable placards are also posted about in conspicuous places throughout the county. The dispensaries are located usually in some public schoolhouse in five or six widely separated, easily accessible places in the county. They are open for six or eight hours one day in each week for five or six weeks. Those who visit the dispensary are lectured to about the disease, given literature on it, shown the eggs and parasites, and those found infected given thymol and salts. Very probably something like 200,000 people have been treated in these dispensaries.

During all this work, from its very beginning, the educational feature has been stressed. Lectures, usually illustrated, have been given to almost every organization in the States; an enormous amount of literature on the disease has been distributed, and the cooperation of the press has been unstinted.

METHODS FOR THE ERADICATION OF HOOKWORM DISEASE.[1]

JOHN A. FERRELL (M. D.), North Carolina State Board of Health, Raleigh, N. C.

Hookworm disease may be eradicated by the effective application of simple methods, preventive or curative. Its eradication by preventive means is dependent upon the installation and uniform use of sanitary privies by all the people in infected areas. The curative method is based upon the successful treatment of every infected person. In a democracy the application of either method is dependent on teaching the people. The most apt method of teaching is by demonstration. The best demonstration of the disease and its importance is a cured person. Hence the method thus far pursued in the South, though general to a certain degree, has been featured by curing sufferers.

The treating has been done by the general practitioners and by whole-time health officers representing the State boards of health

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and the Rockefeller Commission conjointly. The former, numbering about 21,244 physicians, have reported 68,377 treated cases up to June 30. The latter, numbering 50 physicians in 10 Southern States, have treated during the one and one-half years preceding June 30, 152,891 persons, making a total of 221,368 people treated. The 152,891 persons treated for demonstrative purposes have been reached by the campaign forces through State and county dispensaries for the free examination and treatment for the disease of all applicants. The same general plan for the dispensary work is followed throughout the South and was used in Porto Rico.

The county is the unit for the dispensary work. It is conducted by a physician representing the State board of health. He begins the work by securing from the board of county commissioners a small appropriation of $200 or $300 to defray the local expenses occasioned by the publicity work, cost for thymol, and traveling expenses of the microscopist who is his assistant.

The commissioners, in making the appropriation, designate five places in the county as dispensary points, each of which, on a stated day of the week, have a dispensary for the four to eight weeks' duration of the county campaign.

The work of the commissioners completed, the director sets about to secure a large attendance on the various dispensaries. By personal visit or letter he seeks and usually obtains the active cooperation of the doctors, teachers, editors, and 200 or more of the leading citizens of the county.

In addition, the county is flooded with newspapers announcements, posters, and handbills giving information relative to the itinerary, the bringing in of specimens of feces, etc. The crowd assembling on the first dispensary day represents usually the better element. It witnesses the use of the miscroscope, the collection of intestinal parasites, an exhibit of photographs of uncured and cured patients, charts, literature, etc., and much interest is aroused from the beginning. Each successive week finds the crowds increasing in size, bringing back again and again those found infected until cures are made. The examination of anywhere from 50 to 400 people daily is customary, all examinations being based on the microscopic recognition of the ova in the feces.

The county appropriation is of the utmost importance, as it is an official announcement that hookworm disease is recognized as such a menace to life, health, happiness, and useful citizenship that special appropriation by the county for combating it is warranted. The wisdom of the investment is so promptly apparent that in North Carolina (my State) where 53 counties have appropriated more than $12,500 for this work I am yet to hear the first criticism from the most partisan or the most miserly citizen.

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The results of treatment in many cases are truly marvelous. A gain of a pound daily is common. Patients brought in on stretchers have been restored to normal health in a few weeks at a cost of only a few cents. The witnessing, by the people in all sections of the county, of the transformations from invalidism, blighted ambition, misery, and poverty, to health, happiness, and productive activity, does the teaching which excites them to action not only to cure the sufferers but also to throw about all sanitary protection. There is now seldom found skepticism or a lack of cooperation among the doctors, teachers, editors, officials, or others in those counties where the work has been conducted.

The installation and use of sanitary privies do not give to the layman apparent and speedy results, yet it calls for an investment of several dollars for each family. This phase of the work, therefore, though progressing steadily, has not yet made sufficient headway in rural districts to eradicate the disease by preventive measures. We trust, however, that contemplated measures for more rapid progress in this phase of the campaign will soon make it rival the gratifying progress being made in treating the disease.

DISCUSSION.

Dr. W. H. SCHULTZ, Hygienic Laboratory, Washington, D. C., summarized the results of some experiments carried on during the past two years. It was observed that the larvæ of *Ankylostoma caninum* and of *Necator americanus* react toward various physical forces as follows:

1. The young larvæ as a rule remain in contact with the moist culture media, but the infecting stage breaks away from the culture media as soon as it finds a film of water the borders of which it can extend. When conditions of temperature and moisture are favorable the larvæ then become negatively geotropic.

2. The body surface of the larvæ is readily wet by water, and by the aid of capillarity they are enabled to glide over a second surface that is wet by the same fluid. When, therefore, the larvæ come in contact with a film of water they tend to extend its boundaries by gliding through it. This phenomenon is readily observed when a drop of water containing encapsuled larvæ is placed upon the warm skin of the host; the larvæ extend the edges of the drop until a film is formed, whereupon their leverage is increased and infection rendered more easy.

3. At temperatures much below 20° C., and in the dark, mature larvæ may be relatively inactive. A rise of a few degrees centigrade stimulates them as does also light, and they become motile. If exposed to both light and a rise of temperature approximating that of the skin they become highly active and move in the direction of the source of warmth.

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4. In cultures from which project blades of grass, small sticks or other objects upon which a film of water condenses, the larvæ leaves the culture, follows the film, and ascends to the most advantageous point for coming in contact with its host. If water droplets of sufficient size are in the path of the ascending larvæ the parasites enter the water drops and by reason of their higher specific gravity settle to the lower edge of the drop and in this way may accumulate in great numbers. These larvæ may live for many days if not exposed to bright light or to drying.

5. Larvæ may live in distilled water, in sealed glass tubes, for six months when kept in the dark. If exposed to direct sunlight they die after two or three weeks or sooner, depending upon the intensity of the light. If, however, the water be removed from a mass of larvæ, they die within a few hours, and when fed to a host do not infect it.

The practical applications of some of these observations are as follows: Individuals whose clothes or skin become wet by reason of walking through the grass of infected regions after a rain or after heavy dews are more apt to become infected than when passing through the same region when everything is dry.

It is possible for infections to occur from eating fresh green vegetables from gardens fertilized with a water extract of infected night soil and also from eating uncooked vegetables raised in gardens upon which opens an insanitary privy. Since the larvæ may live, if once carried there, for long periods of time in the droplets of water between the leaves, and are stimulated to greater motility by risers of temperature approximating that of the surface of the human skin, and since they move in the direction of the source of heat, it has been proved that the larvæ are greatly facilitated in reaching the skin surface of the host when any part of the host's body is exposed to the water containing the larvæ. It is remarkable how quickly the parasites orient themselves toward the convection currents set up by the host's body. Furthermore, the reason why larvæ seek the edge of an infected pool is to be explained by their filmotactic and thermotactic reactions.

Finally, one of the most potent protective agencies in nature against persistent and exaggerated conditions of infection is to be found in the killing effect of drought and bright sunlight. For myriads of larvæ are caught upon elevated surfaces where the droplets of water soon evaporate and the larvæ are agglutinated in a dry mass and cease to be capable of infecting their host.

Dr. CLAUDE A. SMITH asked Major Ashford whether infection through shoes produced eruption on toes or on ankles.

This shows that they probably passed through the macerated leather. I have found them passing through several layers of cloth into the skin.

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The climatic conditions have much to do with the frequency of infection. The opportunity for infection is presented only two or three times in a summer.

C. W. STILES: The doses proposed by the Porto Rican Commission have been adopted quite generally in this country, namely: 1 to 5 years old, 7.5 grains maximal dose in 1 day; 5 to 10 years old, 15 grains; 10 to 15 years old, 30 grains; 15 to 20 years old, 45 grains; 20 to 60 years old, 60 grains; above 60 years old, 30 to 45 grains.

Dr. SAMUEL T. DARLING: Besides the salutary effect on the population of Panama following the introduction of sanitary measures against soil pollution, another very important factor in the reduction of the morbidity from hookworm disease has resulted from the inauguration of more prosperous times among the laboring and, in fact, the entire, population. When we went to Panama we found a great deal of hookworm disease, and some fatal cases were seen from time to time among the natives who were either barefoot or wore rope-bottom cloth shoes; but with the era of prosperity inaugurated by the canal operations the natives, before anything else, improved the quality of their footwear and very soon were wearing stout leather shoes, not infrequently of patent leather.

Among the employees treated at Ancon Hospital we do not now encounter fatal cases of hookworm disease, in which there are from several hundred to several thousand worms, although very mild infections (a dozen worms or less) are common. It has seemed to us that the effects of the better footwear as protective coverings for the feet in reducing the number and gravity of the infections were noticeable before those results following the sanitary disposal of dejecta were obtained.

So far as the individual is concerned, we believe that the mild infections encountered are of very little economic importance. Such individuals, however, would certainly infect their environment, in communities having primitive or other inefficient methods of disposing of dejecta.

With regard to the habits of larvæ in relation to infection, I should say that infection is not so likely to result from contact with grass, for I believe that the larvæ that crawl up grass stems and get into drops of dew are soon destroyed by the morning sun. In my opinion infection is more commonly the result of direct contact with polluted soil, and the larvæ that infect are those living in fecal puddles in the polluted soil which are not dried up by the sun.

[1] Other phases of the campaign against hookworm disease in the South are very interesting. The organization of the work is given in the First Annual Report of the Rockefeller Sanitary Commission. The infectious and sanitary surveys by counties are described in the Second Annual Report of the Commission. These publications and additional information may be had on request to the Rockefeller Sanitary Commission, 725 Southern Building, Washington, D. C.

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JOINT SESSION OF SECTIONS IV AND IX, FRIDAY AFTERNOON, SEPTEMBER 27, 1912.

INDUSTRIAL ACCIDENTS AND TRADE DISEASES IN THE UNITED STATES.

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It is only within recent years that the subject of industrial hygiene as conditioned by trustworthy mortality and morbidity statistics has received serious and qualified consideration in the United States. The term "occupational or industrial disease" is not defined in American law, but the term has become standarized in English legislation since the passage of the workman's compensation act of 1906. In an exact sense there are few true occupational diseases or morbid conditions due entirely and exclusively to occupational pursuits. In the broader and more general sense, however, an industrial disease has been properly defined in the memorial to the President of the United States on occupational diseases, as "morbid results of occupational activity traceable to specific causes or labor conditions, and followed by more or less extended incapacity for work." As defined in this sense the field of occupational diseases is, of course, vastly larger than the field of occupational mortality, since a large proportion of morbidity resulting from health-injurious employments is not necessarily followed by death in consequence thereof. The general literature of the subject of industrial hygiene is immense, but the really valuable contributions thereto, with a special regard to American conditions, are few indeed; and what is best and most useful has only been made public during recent years. The comparatively modern attention to the subject is largely the result of the public interest in effective statutory regulation of workmen's compensation for the consequences of industrial accidents, and, though to a lesser extent, for industrial diseases. A considerable demand has therefore arisen for trustworthy statistics of occupational mortality, but the paucity of useful data is lamentable evidence of the neglect of this important subject in the past.

NECESSITY FOR ACCURATE RECORDS OF INDUSTRIAL ACCIDENTS AND INDUSTRIAL DISEASES.

As a first step toward the attainment of a more intelligent understanding of the health problems in industry which require to be solved, it is necessary that accurate records be kept of the occurrence

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of industrial diseases and industrial accidents. The best results in this direction can be secured only through compulsory notification upon the basis of a carefully devised plan in conformity to successful experience obtained in this field of social legislation abroad. As a further step, and a less difficult one, there is the necessity for a qualified statistical analysis of the occupational mortality data of the registration area of the United States, the records of which constitute a most valuable source of information which heretofore has been practically neglected. Unless the analysis is made by approved statistical methods the results must fall far short of their purpose, and otherwise trustworthy facts may lead to erroneous conclusions. It is on this account that the earlier occupation mortality statistics collected for many years in some the the States and cities of the United States, and published only with reference to the average age at death, have hindered rather than helped the cause of industrial hygiene. The statistical fallacy inherent in the method of determining occupational mortality by means of the average age at death is so obvious that it requires no discussion at this time.

PRACTICAL UTILITY OF THE PROPORTIONATE MORTALITY.

It is difficult to understand why the illustrious example of correct statistical analysis of occupational mortality as first introduced by Farr in the supplements to the decennial reports of the Registrar General for England and Wales should not have been followed in the United States, and then only in part, until 1890, when the census reports for that year were made to include a more or less qualified discussion of occupational mortality in the registration area of the United States. For life insurance purposes, the rate of mortality as determined by the number dying out of a given number living, according to age and sex, is, of course, essential, but for public health purposes, and particularly in relation to the broad questions involved in the modern problems of industrial hygiene, the proportionate mortality is probably more conclusive in that it emphasizes the true incidence of preventable causes of death by divisional periods of life. This method has the further advantage that the data required are obtainable with less difficulty than the twofold returns of the living and the dying, usually secured by different methods; that is, the first by enumeration and the second by the official registration of deaths.

The difficulty is gradually being overcome by standardized methods of occupation classification and the inclusion of an additional question in the standard death certificate. In due consideration of this serious liability to error, the proportionate mortality, limited entirely to a statistical analysis of the returns of deaths by occupation, and with a due regard to divisional periods of life, has

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certain practical advantages, particularly in the case of occupational inquiries, from the viewpoint of preventive medicine and social reform.

UNITED STATES CENSUS REPORTS ON OCCUPATIONAL MORTALITY.

There are no references to occupational mortality data in the census reports previous to 1870. In the volume on Vital Statistics of the Ninth Census (pp. 403–412) is a table of deaths by causes, and nine specified but more or less ill-defined occupations for the United States as a whole and the several States. The occupations are: Agriculturists, clergymen, laborers, lawyers, merchants and clerks, mill and factory operatives, mechanics, all others, physicians, and teachers. A classification of this kind, of course, could not possibly serve the modern requirements of industrial hygiene. The causes of death are also only given by groups of diseases and without distinction of age, so that a trustworthy comparison of the mortality in one group with that of another is obviously out of the question. The table is referred to merely as a curiosity in the literature of vital statistics.

In the Tenth Census, for the year 1880, occupation mortality statistics were published for cancer only (vol. 12, pt. 2, pp. 576–577). The mortality from this cause is given for 34 specified occupations, with distinction of sex and age, but since the mortality from all causes for these occupations was not given the table serves no practical purpose whatever. Volume 1 of the census of that year also contains a table of occupations by ages, differentiating, however, only the periods 10–15, 16–59, and 60 and over. Preliminary to the tables are some remarks upon each list of occupations, and upon the numbers returned under the several titles, which, from an historical point of view, is a document of some importance. In the absence of all other statistical information something of value is disclosed by the ascertainment of the proportion of persons employed in particular pursuits at ages 60 and over, but the element of error is very serious, and a full understanding of the conditions under which the several trades are carried on, the probable rate of elimination or retirement of occupied persons in different pursuits, and the effect of a probable favorable or unfavorable mortality require to be taken into account. It is difficult to understand why, in so elaborate an undertaking as the census of 1880, the analysis of the mortality should not have been extended to occupations, so that for the registration area at least the proportionate mortality from specific causes in occupations more or less dangerous or injurious to life could have been determined with a reasonable degree of approximate accuracy.

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UNITED STATES CENSUS OF 1890.

The first qualified Government inquiry into the relation of occupation to deaths was made in connection with the United States census of 1890. In the report on Vital Statistics, published in 1896,[1] it is stated at the outset, however, that—

> The data furnished by the census returns for the calculation of death rates of persons engaged in different occupations are not sufficient in quantity or accuracy to give reliable results for more than a few occupations embracing large numbers of people or for classes of occupations including several distinct occupations of generally similar character or influence upon the health of the people employed therein.

The analysis of the returns, by occupation, was limited to the registration area, including a male population, ages 10 and over, of 5,809,803, and 71,346 deaths from all causes. The general death rate for all occupied males for the registration area was therefore 12.3 per 1,000. For reasons of greater accuracy, however, most of the analysis was limited to the population of the registration States, numbering in 1890, 3,491,407 and including during the census year a mortality of 48,306. For this group of States the mortality rates per 1,000, by selected occupations, ages 25–44 and 45–64, were as follows:

Death rates per 1,000 of population (occupation mortality statistics, census of 1890).

Occupations.	Registration States, 1890.[a]		England and Wales, 1880–1882.	
	25 to 44 years.	45 to 64 years.	25 to 44 years.	45 to 64 years.
All males	11.59	23.04	10.16	25.27
Occupied males	9.29	18.43	9.71	24.63
Clergymen	5.88	14.72	4.64	15.93
Lawyers	8.50	21.68	7.54	23.13
Physicians and surgeons	9.52	21.15	11.57	28.03
Teachers	6.18	14.35	6.41	19.84
Musicians and teachers of music	10.59	25.65	13.78	32.39
Commercial travelers and salesmen	5.78	12.97	9.04	25.03
Apothecaries, pharmacists, etc	11.47	27.79	10.58	25.16
Butchers	11.83	26.24	12.16	29.06
Bakers and confectioners	11.19	28.45	8.70	26.12
Barbers and hairdressers	11.80	24.89	13.64	33.25
Tailors	8.57	28.17	10.73	26.47
Boot and shoe makers	8.65	21.26	9.31	23.86
Bookbinders	16.67	13.76	11.73	29.72
Plasterers and whitewashers	13.20	25.56	7.79	25.07
Cabinetmakers and upholsterers	9.31	21.90	9.55	24.77
Carpenters and joiners	7.11	16.60	7.77	21.74
Blacksmiths	9.02	18.56	9.29	25.67

[a] Eleventh Census of the United States (1890), Vital Statistics, Part I, p. 65.

The English data for 1880–1882 are given for purposes of convenient comparison. It would appear that the rates represent the facts with approximate accuracy and that, as a general rule, the

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mortality rate was somewhat less in the United States than in England and Wales.

The chief defect in the analysis of the census of 1890 is the neglect to give the causes of mortality by divisional periods of life. To give this information without reference to age deprives all returns of this kind of practical utility. As a result of this omission some of the rates, by causes, as given in the census of 1890 are seriously misleading, and particularly so for occupations with a large proportion of persons aged 65 and over. It is stated, for illustration, that in comparison with the average death rates of males in the professional class, the death rates of clergymen from respiratory diseases, nervous diseases, and heart diseases were very high, which, of course, would be largely, if not entirely, due to the fact that the proportion of clergymen aged 65 and over (13.06 per cent) was decidedly above the average for the corresponding proportion for the professional class as a whole (6.92 per cent). Most of the tables and the statistical analysis serve, therefore, no practical purpose whatever. The cause of industrial hygiene was hindered, rather than helped, by the census mortality investigation of 1890, and much the same is to be said of the investigation of 1900.

UNITED STATES CENSUS OF 1900.

In the report on the Vital Statistics of the census of 1900,[2] it is stated in regard to occupation in relation to deaths, that—

> The data available for studying the influence of occupation upon the death rate in various localities or from different causes consist of the returns made by the enumerators showing the occupations of the living population, and the registration record of deaths, which show, to a certain extent only the occupations of decedents. They are not fully comparable, because the enumerators made their returns of occupations in accordance with certain definite instructions concerning the manner of stating occupations, while the physicians or others reporting deaths in the registration areas stated occupations according to their individual understanding and entirely without uniformity.

Obviously, results derived from two more or less conflicting sources are not likely to be trustworthy or conclusive. Limiting the data considered to a population in registration States of 5,575,745 and to 83,815 deaths, the resulting death rate was 15 per 1,000 for 1900, against 13.8 for 1890. No information is available to show why there should have been this increase, which occurred chiefly among persons employed in the clerical and official class, and agriculture, transportation, and other outdoor pursuits. According to the report, the death rate of farmers, planters, and farm laborers increased from 11.9 per 1,000 in 1890 to 17.6 in 1900, a result plainly at variance with observed mortality conditions throughout the country, and due, no doubt, entirely to differences in methods of classi-

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fication and analysis. According to the same report, the mortality rate of bankers, brokers, and officials of companies increased from 4.7 per 1,000 in 1890 to 11.8 in 1900. The supplementary term, "officials of other companies," indicates the probable source of error invalidating conclusions based upon the earlier figure, and probably also upon the figure for 1900. The method of analysis was practically identical with that of 1890, and as a result the report is of very limited practical value and utility. The same error was made as in 1890 in not extending the analysis to causes, by divisional periods of life, and as a result some of the conclusions are seriously misleading and entirely at variance with facts disclosed by more trustworthy methods of inquiry. The analysis of 1900, however, was more extensive in regard to occupations in detail, and groups of occupations were considered by divisional periods of life, but only with reference to the mortality from all causes. The following table is included for purposes of convenient comparison:

Death rates at certain ages (occupation mortality statistics, census of 1900).[a]

Classes.	Age.				
	All ages.	15 to 24 years.	25 to 44 years.	45 to 64 years.	65 years and over.
All occupations	15.0	5.1	8.8	19.9	98.4
Professional	15.3	4.8	7.6	20.7	105.6
Clerical and official	13.5	7.2	11.1	19.9	55.9
Mercantile and trading	12.1	2.6	6.7	19.9	98.8
Public entertainment	15.4	5.2	11.6	23.8	68.0
Personal service, police, and military	12.9	5.9	8.2	19.9	64.0
Laboring and servant	20.2	7.7	13.9	31.9	126.6
Manufacturing and mechanical industry	13.8	4.4	8.4	20.2	105.4
Agriculture, transportation, and other outdoor	15.8	4.6	6.6	14.7	96.7
All other occupations	6.5	3.1	6.5	12.7	55.5

[a] Twelfth Census of the United States, 1900, Vital Statistics, Part I, p. cclxi.

For life insurance purposes such a table has some value as disclosing important variations in the general death rate of different occupational groups. For the larger needs of the community, however, particularly in the important field of industrial hygiene, death rates by occupations, and without reference to causes and divisional periods of life, are of no practical utility whatever. In its final analysis the mortality problem in any industry or employment is conditioned by the causes which give rise to an excessive death rate or a material departure from the normal. This principle has long been recognized in English vital statistics, in which the details are given in full for all the principal causes, by divisional periods of life and for all of the occupations considered, in the decennial supplements to the annual reports of the Registrar General. Obviously this method should have been followed in the reports on the vital

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statistics of the censuses of 1890 and 1900, and if this had been the case the analysis would not only have been less costly but measurably more valuable for the practical needs of the community.

RECENT CENSUS REPORTS ON OCCUPATIONAL MORTALITY.

Since the establishment of a permanent Census Office the collection and analysis of the vital statistics of the registration area has been a function of that office, in charge of the Division of Vital Statistics, which has published annual reports and preliminary bulletins in anticipation thereof. Two of these bulletins contain occupation mortality statistics, and in course of time the cumulative results will prove most useful. The method of calculating more or less misleading rates has been discarded, and in place thereof the proportionate mortality has been calculated by causes and divisional periods of life. Granting the limitations of this method, it remains for practical purposes, and particularly with regard to the needs of industrial hygiene, the most useful one available.

The analysis includes 27 specified causes of death, or groups of causes, and 8 divisional periods of life, from 10 to 65 years and over. As illustrating the practical utility of this method, a brief reference may be made to the comparative proportionate mortality of farmers and printers from tuberculosis of the lungs. At ages 15 to 19 the percentage of deaths from tuberculosis of the lungs, in the mortality from all causes, was 17.2 for farmers against 35.8 for compositors, printers, and pressmen. The proportion increased at ages 20 to 24 to 26 per cent for farmers against 47.5 per cent for printers. The proportion then decreased at ages 25 to 34 to 25.6 per cent for farmers, but it increased to 49.2 per cent for printers. At ages 35 to 44 the percentage of deaths from this cause was 18.7 for farmers against 40.6 for printers; and at ages 45 to 54 it was 11.7 for farmers against 20.6 for printers. Subsequent to this age the mortality from tuberculosis is relatively of small importance.

For reasons not stated, the occupation mortality returns for 1910 were not printed in the preliminary bulletin, but it is quite probable that much more extended consideration will be given to the subject in the forthcoming publication of the final report on the year 1910, with a due regard to the results of the census of that year.[3] It is also possible that the method used for many years by the Registrar General for England and Wales in calculating occupational death rates for a three-year period, upon the basis of the occupation census returns for the central year, may be followed. There can be no question of doubt that in view of the much larger area now comprehended

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by the registration returns, the practical results of such an inquiry would be of much greater value than any heretofore obtained. In view, however, of the serious technical difficulties in securing absolutely trustworthy returns with regard to occupations by means of an enumeration of the population, and the methods of death certification as at present in use, the proportionate mortality, rather than occupational death rates, would seem to best serve the general public requirements for information of this kind.

STATE AND MUNICIPAL REPORTS ON OCCUPATIONAL MORTALITY.

With the exception of the State of New Jersey, and there only for very recent years, not a single State report on vital statistics contains really useful and conclusive information on the subject of occupational mortality statistics. For many years returns have been published in the annual reports of the State board of health of Rhode Island, but the tables fail to disclose the most essential facts required for the purposes of industrial hygiene, and that is, the mortality by occupations according to ages and causes of death. The Rhode Island reports give the average age at death, which, as a rule, is more or less misleading. Considering the long period of years for which the Rhode Island returns have been published, it is lamentable that so exceptional an opportuity should have been neglected. For the State of New Jersey, within very recent years, by an unfortunate omission of the deaths from all other causes by ages, the annual returns have been impaired in value; but it is practically certain that in future the reports will contain the full tabular analysis of causes of death, by divisional periods of life, for the principal occupations typical of the State of New Jersey. The reports in question will provide a most useful basis of trustworthy facts for the needs of industrial hygiene in that State. No municipality has followed the long-established methods of Blackburn and Sheffield, England, by including each year a tabular analysis of the mortality of the chief industrial occupations typical of the communities referred to.[4]

In brief, the subject of occupational mortality statistics has been entirely neglected by American municipalities, although the field is the most promising of all in that the facts are strictly localized and subject to a qualified interpretation by registrars familiar with antecedent causes and conditions responsible for abnormal departures from the general death rate. For illustration, if the health board of a city with a large mining population, like Scranton, or a large textile population, like Lowell, were to publish annually a table showing the proportionate mortality of miners or textile workers, respectively, in the manner and in conformity to the method as laid down in the census bulletins of mortality for 1908, the public interest of these

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respective communities would be served to the best possible advantage in that the facts disclosed would be within the understanding of those responsible for more or less health-injurious conditions in industry. On the part of the medical profession there would be necessary the understanding of the methods and means by which many of the evils disclosed could be ameliorated or done away with. Considered from this point of view, the best possible results in the field of occupational hygiene are obtainable through local investigations rather than by means of national or even State returns, and what is possible for the cities of Blackburn and Sheffield, England, which are cited as convenient illustrations, would certainly seem possible for most of the industrial communities of America.

MORTALITY OF COPPER MINERS OF BUTTE, MONT.

Although the subject of municipal occupational mortality statistics has been much neglected, there is a large amount of valuable material to be derived from trustworthy sources by means of a special analysis of carefully selected returns. The best illustration of what can be done by this method of research is the following analysis of 1,221 deaths of copper miners in the city of Butte, Mont., officially recorded during the five years ending with 1911.[5] At ages 15 to 24, out of 83 deaths of copper miners from all causes, 34, or 41 per cent, were from accidents, and 7, or 8.4 per cent, from tuberculosis of the lungs. At ages 25 to 34, out of 279 deaths from all causes, 92, or 33 per cent, were from accidents, and 59, or 21.1 per cent, were from tuberculosis of the lungs, but in addition thereto 34 deaths, or 12.8 per cent, were from pneumonia. At ages 35 to 44, out of 338 deaths from all causes, 113, or 33.4 per cent, were from tuberculosis of the lungs; 51, or 15.1 per cent, were from accidents; and 46, or 13.6 per cent, from pneumonia. At ages 45 to 54, out of 310 deaths from all causes, 114, or 36.8 per cent, were from tuberculosis of the lungs; 37, or 11.9 per cent, from accidents; and 32, or 10.3 per cent, from pneumonia. At ages 55 to 64, out of 134 deaths from all causes, 39, or 29.1 per cent, were from tuberculosis of the lungs; 18, or 13.4 per cent, were from pneumonia; 16, or 11.9 per cent, were from other respiratory diseases; and 10, of 7.5 per cent, from valvular disease of the heart. At ages 65 and over there were only 72 deaths from all causes, so that an anaylsis in detail is not quite conclusive, but the principal causes of death were pneumonia and other respiratory diseases, tuberculosis of the lungs, and valvular disease of the heart. Whatever objection may be raised against the use of this method of statistical analysis, it is at least approximately conclusive with regard to the principal causes of death, by divisional periods of life. Whether the mortality rate is excessive or not is secondary to the

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question as to the principal causes of death which are so largely preventable in their nature, and this is especially emphasized in the Butte mortality returns, according to which over half the mortality at ages under 45 is the result of two predominating causes; that is, accidents and tuberculosis of the lungs. It is furthermore shown that the proportionate mortality from tuberculosis among copper miners in the Butte district increases progressively from 8.4 per cent at ages 15 to 24 to a maximum of 36.8 per cent at ages 45 to 54. Whether the prevailing disease is a true form of tuberculosis or a true form of fibroid phthisis or a combination of both is of secondary importance to the question as to whether the excessive frequency of this disease among copper miners is or is not directly attributable to the continuous and considerable inhalation of mineral dust produced chiefly in drilling operations and in the crude handling of ores and rock underground.

MORTALITY OF TEXTILE WORKERS OF LAWRENCE, MASS.

A similar analysis has been made of the mortality of textile operatives in the city of Lawrence, Mass., covering the period 1898–1907. There were 934 deaths of males from all causes, of which 167, or 17.9 per cent, were from tuberculosis of the lungs. There were 523 deaths of female operatives from all causes, of which 178, or 34 per cent, were from tuberculosis of the lungs. The proportionate mortality from this disease was highest among males at ages 25 to 34, when out of 122 deaths from all causes 46, or 36.7 per cent, were the result of this specific cause. For females the proportionate mortality was much higher, and out of 115 deaths from all causes at ages 25 to 34 the number of deaths from tuberculosis of the lungs was 54, or 47 per cent. It needs no further illustrations to emphasize the practical utility of the proportionate mortality figure, by selected causes and divisional periods of life. It would not seem to require further illustrations to sustain the conclusion that the mortality records of our municipalities contain a vast amount of valuable material which can be utilized to considerable advantage in the furtherance of far-reaching measures of social and economic reform.[6]

UTILITY OF MORBIDITY STATISTICS OF LABOR ORGANIZATIONS.

There is also much valuable material to be derived from a qualified analysis of the experience data of labor organizations maintaining insurance or so-called beneficial departments. Since the experience includes both sickness and mortality, an analysis of the facts by causes, and with a due regard to sex and divisional periods of life, is often productive of valuable and decidedly suggestive results. I have had occasion to make a careful study of the expe-

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rience data of the Cambria Mutual Benefit Association, which includes chiefly iron and steel workers, and a relatively small proportion of miners. The data are not available by ages at death, but it is suggestive that out of 330 deaths from all causes during the period 1900–1906, 36.9 per cent were deaths from accidents; 13.3 per cent were deaths from "lung trouble," probably including a large proportion of deaths from tuberculosis; 10.5 per cent of the deaths were from pneumonia; and only 0.8 per cent were from tuberculosis of the lungs specifically so defined. A careful analysis of the occupational mortality data of the city of Johnstown, at which the Cambria works are located, would therefore unquestionably disclose many important facts with regard to the mortality of iron and steel workers, than which there is hardly a subject of more general interest in the field of occupational hygiene at the present time.

INDUSTRIAL INSURANCE MORTALITY STATISTICS.

The Prudential Insurance Company of America, which is one of the largest industrial insurance companies in the world, has from time to time published the results of its mortality experience with special reference to occupations. The first exhibit of this kind was made at the Louisiana Purchase Exposition in St. Louis in 1904, followed by a special exhibit of the mortality from consumption in dusty trades, contributed to the exhibit of the International Tuberculosis Congress in 1908. The company has also presented a series of occupation mortality charts to the American Museum of Safety in the city of New York. All of these charts and exhibits are limited to a statement of the mortality in specified occupations by principal causes of deaths and divisional periods of life. For several reasons, which do not require discussion, it has not been found feasible to calculate the rate of mortality as it prevails in selected occupations in the manner or after the method of the registrar general of England and Wales. The method adopted in determining the incidence of the mortality from specified causes in selected occupations has therefore been the proportionate mortality by divisional periods of life which has since been made use of in the reports on occupation mortality of the Division of Vital Statistics of the United States Census Bureau. This method has the unquestionable advantage of emphasizing the true incidence of particular causes in the mortality from all causes which, from the point of view of preventive medicine and industrial hygiene, must always constitute as a rule a more conclusive test than the rate of mortality derived from the number of living or the expectation of life determined by means of more or less accurately calculated life tables. This conclusion may seem at variance with accepted theories, but in practical experience the method has abundantly demonstrated

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its utility for life insurance and other purposes. The exhibit made by the Prudential at the exposition of the International Congress on Hygiene and Demography affords an ample illustration of the method employed and the practical utility of the results disclosed by a simple statistical analysis adapted to all occupation mortality data, whether derived from official sources or from the experience of life insurance companies. Copies of these charts have been presented by the company, on request, to Yale, Columbia, the College of the City of New York, and other institutions of learning.

The recent occupational industrial mortality experience of the Prudential comprehends the four years, 1907–1910. The experience is limited to occupied males only, and includes 103,434 deaths. The following table exhibits the distribution of the mortality by principal groups of occupations and industries, classified in conformity to the official index to occupations as used by the population division of the Thirteenth Census of the United States. This index is by far the most useful work of its kind, and a decided improvement over the index prepared in 1896 by Mr. Charles F. Pidgin for the use of the Massachusetts Bureau of Statistics.

Mortality by occupations and industries in the industrial experience of The Prudential Insurance Co. of America, 1907–1910. (Occupied males only.)

	Number of deaths.	Per cent.
Agriculture and forestry	5,283	5.1
Mines and quarries	2,174	2.1
Manufactures	59,606	57.6
Transportation	12,047	11.6
Trade	13,089	12.7
Public service and defense	2,677	2.6
Professional	1,998	1.9
Domestic and personal	6,301	6.1
Miscellaneous	264	.3
Total	103,434	100.0

This table amply justifies the term " industrial " as applied to legal reserve life insurance conducted on the weekly payment plan. The predominating employments are strictly industrial pursuits and largely such as in the light of modern research are subject to a mortality rate above the average for the mercantile and professional classes of the population.

ANALYSIS OF OCCUPATIONAL MORTALITY BY DIVISIONAL PERIODS OF LIFE.

Considering all occupied males, ages 15 and over as a group, it is brought out by the Prudential experience that 50.5 per cent of the mortality was attributable to four specific causes, or, respectively, 21.4 per cent was caused by tuberculosis of the lungs, 10.9 per cent by Bright's disease, 9.3 per cent by accident, and 8.9 per cent by pneu-

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monia. At ages 15 to 24, however, the proportionate mortality from tuberculosis of the lungs was 34.3 per cent; from accidents, 20.4 per cent; from pneumonia, 6.8 per cent; and from typhoid, 6.8 per cent also; or, in other words, 68.3 per cent of the deaths from all causes in this age group resulted from four specific and precisely defined causes. At ages 25 to 44 the proportionate mortality from tuberculosis of the lungs was 37.7 per cent; from accidents, 11.2 per cent; from pneumonia, 8.3 per cent; and from Bright's disease, 7.9 per cent; or, in other words, 65.1 per cent of the mortality from all causes resulted from four specific causes, varying from the previous group to the extent that typhoid fever is replaced by Bright's disease as the fourth most important cause of death. At ages 45 to 64, relatively the most important cause of death remains tuberculosis of the lungs, causing 13.7 per cent of the deaths from all causes. The mortality from Bright's follows with 13.6 per cent; pneumonia with 9.9 per cent; and accidents with 7.4 per cent; or, in other words, of the mortality from all causes, 44.6 per cent at ages 45 to 64 were attributable to four specific causes. It is shown, therefore, that with advancing years the incidence of mortality becomes more varied and the particular importance of the predominating diseases fatal during the earlier years of life becomes less. At ages 65 and over the most important cause in the proportionate mortality is Bright's disease, with 14.2 per cent; followed by apoplexy, with 12.1 per cent; valvular disease of the heart with 9.8 per cent; and pneumonia with 9.1 per cent. The four causes, in the aggregate, resulted in a mortality of 45.2 per cent of the mortality from all causes. The details of the proportionate mortality, by divisional periods of life, are given in the Statistical Appendix.

ANALYSIS OF OCCUPATIONAL MORTALITY BY PRINCIPAL CAUSES.

Typhoid fever among occupied males is relatively of most importance at ages 15 to 24, when, out of the mortality from all causes in this group, 6.8 per cent results from this specific cause. The mortality from diarrheal, septic, and other zymotic diseases is not relatively of material importance in that the proportionate mortality does not reach 2.5 per cent for any divisional period of life. Alcoholism attains its maximum degree of frequency at ages 25 to 44, when, out of the mortality from all causes, 2.6 per cent results from this specific cause. Rheumatism, however, is relatively of small importance, and only at ages 15 to 24 does the percentage reach as high as 1.2 of the mortality from all causes in this group. Cancer attains its maximum degree of relative frequency at ages 45 to 64, with 6.5 per cent, but the proportionate mortality is almost exactly the same at ages 65 and over, or 6.4 per cent.

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Tuberculosis of the lungs is relatively of most importance at ages 25 to 44, when, out of the mortality from all causes in this group, 37.7 per cent results from this specific cause. The relative proportion at ages 15 to 24, however, is not much less, or 34.3 per cent; but there is a substantial reduction in the proportion at ages 45 to 64, when the percentage is only 13.7, and a still further reduction at ages 65 and over, when it is 3.3 per cent. Tuberculosis of the lungs, however, is proportionately the principal cause of death for each of the three divisional periods of life under 65. The mortality from other tubercular diseases is relatively unimportant, attaining a maximum at ages 15 to 24, with 1.2 per cent. Other constitutional diseases do not at any period of life attain to as much as 2 per cent, the maximum being reached at ages 45 to 64, with 1.8 per cent. Old age, or premature senility, accounts for 4 per cent of the deaths from all causes at ages 65 and over, but this proportion in the mortality experience of an industrial company is affected by the fact that the companies do not as a rule insure persons over the age of 70.

The mortality from apoplexy attains its actual maximum during the period 45 to 64, with 2,887 deaths out of 38,805, or 7.4 per cent; but the relative mortality from this disease is highest at ages 65 and over, or 12.1 per cent, or, in actual numbers, 2,548 deaths from apoplexy out of 21,007 deaths from all causes. The mortality from paralysis follows about the same course, the proportionate ratio attaining its maximum at ages 65 and over, with 3.8 per cent. Insanity accounts for more than 1 per cent of the mortality at only one divisional period of life—that is, ages 45 to 64—when it attains to 1.1 per cent. The proportionate mortality from other nervous diseases is highest at ages 15 to 24, with 3.1 per cent. The actual number of deaths was largest at ages 25 to 44, but only 1.9 per cent of the mortality from all causes in this age group.

The mortality from valvular diseases of the heart was relatively highest at ages 65 and over, when 9.8 per cent of the mortality from all causes resulted from this specific cause. Heart disease, not otherwise specified, followed much the same course, the proportionate mortality, however, being only 4.6 per cent at ages 65 and over. Other circulatory diseases are actually and relatively of small importance except at ages 65 and over, when, of the mortality from all causes, 2.1 per cent of the deaths resulted from this more or less ill-defined group of causes.

Asthma attains its actual maximum in numbers at ages 45 to 64, but the relative mortality from this disease is highest at ages 65 and over, or 1.4 per cent of the mortality from all causes. The same is true of bronchitis, which attains its proportionate maximum at ages 65 and over, with 2.8 per cent. Pneumonia is subject to a less definite tendency, but there is a fairly progressive increase from 6.8 per cent

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at ages 15 to 24 to 8.3 per cent at ages 25 to 44, and to a maximum of 9.9 per cent at ages 45 to 64, subsequent to which the proportion diminishes to 9.1 per cent. Other respiratory diseases follow much the same course, but the actual and relative mortality from this group of causes is of less importance. The maximum proportionate mortality from other respiratory diseases occurs at ages 45 to 64, with 1.6 per cent.

Peritonitis is actually and relatively of small importance, and the highest relative mortality occurs at ages 15 to 24, with 0.5 per cent. Liver diseases reach their proportionate maximum at ages 45 to 64, with 4.4 per cent. Other digestive diseases are of comparatively common occurrence at ages 15 to 24, when the mortality is 5.7 per cent, subsequent to which the proportion diminishes to 3 per cent at ages 25 to 44, increasing to 3.9 per cent at ages 45 to 64 and 4.7 per cent at ages 65 and over.

The proportionate mortality from Bright's disease is highest at ages 65 and over, or 14.2 per cent, but the actual mortality from this cause in industrial-insurance experience was highest at ages 45 to 64, when out of 38,805 deaths from all causes 5,251, or 13.6 per cent, resulted from this specific cause. Other urinary diseases are relatively of small importance except at ages 65 and over, when the proportionate mortality from this group of diseases amounts to 2.7 per cent.

The mortality from diseases of the organs of locomotion is very small throughout every divisional period of life, not attaining to above 0.1 per cent, and the same is true, though to a lesser degree, of the diseases of the integumentary system, which attain their proportionate maximum at ages 65 and over, or 1 per cent.

The mortality from accidents was relatively highest at ages 15 to 24, but the actual number of deaths was largest at ages 25 to 44, when out of 32,866 deaths from all causes 3,677, or 11.2 per cent, resulted from this group of causes. The proportionate mortality diminishes rapidly to 7.4 per cent at ages 45 to 64 and to 4.1 per cent at ages 65 and over.

The mortality from homicide follows somewhat the same course, the maximum proportion occurring at ages 15 to 24, or 0.9 per cent. For suicide the proportionate mortality is much the same at all ages under 65, or, respectively, 2.8 per cent for ages 15 to 24, 2.7 per cent for ages 25 to 44, and 2.3 per cent for ages 45 to 64, subsequent to which the proportion falls to 0.9 per cent at ages 65 and over.

MORTALITY FROM LEAD POISONING.

The only strictly industrial disease for which the information is available is lead poisoning, and even this disease is not necessarily, in all cases, the result of occupational exposure, since lead may be introduced into the human system by other means than exposure to

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lead fumes and lead dust as produced in industrial processes. In the experience of the Prudential there have been 57 deaths from lead poisoning among occupied males out of a total mortality of 103,434. The maximum number of deaths occurred at ages 25 to 44, when there were 25 deaths from lead poisoning, or 0.1 per cent out of a mortality of 32,866 from all causes. The number of deaths from lead poisoning at ages 45 to 64 was 23, or 0.1 per cent out of a mortality of 38,805 deaths from all causes. There were only 4 deaths at ages 15 to 24, and only 5 deaths from this cause at ages 65 and over. Of course, the true incidence of lead poisoning as a cause of death can only be traced in the mortality of an insurance company, or the population at large, by means of the Budapest system of death classification, which takes into account the collateral or contributory causes eliminated by the restricted method of classification by single causes.

MORTALITY BY SELECTED OCCUPATIONS.

Considering the Prudential industrial experience data as exhibited on the occasion of the Fifteenth International Congress of Hygiene and Demography, the general results with regard to 24 specific occupations, including a total of 30,390 deaths at ages 15 and over, have been as follows:

Farmers.—In the experience under consideration the number of deaths of farmers was 4,003. At ages 15 to 24 the principal causes of death were tuberculosis of the lungs, accidents, typhoid, and pneumonia. These four causes resulted in a proportionate mortality of 59.4 per cent of the mortality from all causes in this age group. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 32.1 per cent, followed by accidents with 11.3 per cent, pneumonia with 9 per cent, and Bright's disease with 5.6 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of farmers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	125	32.1
Accident	44	11.3
Pneumonia	35	9.0
Bright's disease	22	5.6
All other causes	164	42.0
Total	390	100.0

At ages 45 to 64 the four most important causes of death were apoplexy, Bright's disease, tuberculosis of the lungs, and cancer, together resulting in a proportionate mortality of 37.9 per cent of the mortality from all causes in this group. At ages 65 and over the principal cause of death was Bright's disease, or 12.6 per cent of the mortality

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from all causes, followed by apoplexy with 12.4 per cent, and valvular disease of the heart with 9.7 per cent.

Clerks.—In the experience under consideration the number of deaths of clerks was 3,443. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 42.4 per cent of the mortality from all causes. At ages 25 to 44 the most important cause of death was also tuberculosis of the lungs, resulting in a proportionate mortality of 44.8 per cent, followed by pneumonia with 8.5 per cent, and Bright's disease with 8.3 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of clerks (ages 25 to 44).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	636	44.8
Pneumonia	120	8.5
Bright's disease	118	8.3
All other causes	545	38.4
Total	1,419	100.0

At ages 45 to 64 the four most important causes of death in this group were Bright's disease, with a proportionate mortality of 17.5 per cent; tuberculosis of the lungs, with 14.2 per cent; pneumonia, with 9.2 per cent; and apoplexy, with 8.9 per cent. At ages 65 and over the principal cause of death was Bright's disease, with 17.1 per cent of the mortality from all causes in this age group, followed by apoplexy, with 13.7 per cent; pneumonia, with 10 per cent; and valvular disease of the heart, with 8.1 per cent.

Coal miners.—In the experience under consideration the number of deaths of coal miners was 1,723. At ages 15 to 24 the principal cause of death was accidents, resulting in a proportionate mortality of 58.1 per cent, followed by pneumonia, with 8.4 per cent, and typhoid, with 6.5 per cent. At ages 25 to 44 the most important cause of death was accidents, resulting in a proportionate mortality of 38.3 per cent, followed by tuberculosis of the lungs, with 14.1 per cent, and pneumonia, with 9.8 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of coal miners (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Accident	144	38.3
Tuberculosis of the lungs	53	14.1
Pneumonia	37	9.8
Typhoid	17	4.5
All other causes	125	33.3
Total	376	100.0

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At ages 45 to 64 the most important cause of death was accidents, or 16.4 per cent, followed by pneumonia with 13.2 per cent, and tuberculosis of the lungs with 12.2 per cent of the mortality from all causes in this age group. At ages 65 and over the most important causes of death were asthma and bronchitis, which, considered as a group, caused 13.2 per cent of the mortality from all causes, followed by pneumonia with 9.7 per cent, digestive diseases with 9.1 per cent, and Bright's disease with 8.2 per cent.

Iron and steel workers.—In the experience under consideration the number of deaths of iron and steel workers was 1,298. At ages 15 to 24 the principal cause of death in this group was tuberculosis of the lungs, resulting in a proportionate mortality of 27.9 per cent followed by accidents with 26.7 per cent, and typhoid fever with 9.3 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 29.7 per cent, followed by accidents with 20.5 per cent, and pneumonia with 8.1 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of iron and steel workers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	154	29.7
Accident	106	20.5
Pneumonia	42	8.1
Bright's disease	40	7.7
All other causes	176	34.0
Total	518	100.0

At ages 45 to 64 the most important cause of death was pneumonia, or 12.8 per cent of the mortality from all causes in this age group, followed by Bright's disease with 12.4 per cent, tuberculosis of the lungs with 10.8 per cent, and accidents with 9.4 per cent. At ages 65 and over the principal cause of death was apoplexy, or 14.1 per cent of the mortality from all causes, followed by Bright's disease with 12.4 per cent, and valvular disease of the heart with 8.6 per cent.

Railroad brakemen.—In the experience under consideration the number of deaths of iron and steel workers was 537. At ages 15 to 24 the principal cause of death was accidents, resulting in a proportionate mortality of 77.2 per cent of the mortality from all causes in this group. At ages 25 to 44 the principal cause of death was also accidents, or 58.7 per cent, followed by tuberculosis of the lungs, with 15.3 per cent. The facts in detail for this age group are given in tabular form:

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Proportionate mortality of railroad brakemen (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Accident	165	58.7
Tuberculosis of the lungs	43	15.3
All other causes	73	26.0
Total	281	100.0

At ages 45 to 64 the most important cause of death was accidents, resulting in a proportionate mortality of 38.8 per cent of the mortality from all causes in this age group, followed by pneumonia, with 8.2 per cent. At ages 65 and over the number of deaths was too small for safe conclusions.

Railroad switchmen.—In the experience under consideration the number of deaths of railroad switchmen was 753. At ages 15 to 24 the principal cause of death was accidents, resulting in a proportionate mortality of 72.5 per cent, followed by pneumonia with 13 per cent. At ages 25 to 44 the most important cause of death was accidents, resulting in a proportionate mortality of 41.8 per cent, followed by tuberculosis of the lungs, with 20.1 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of railroad switchmen (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Accident	77	41.8
Tuberculosis of the lungs	37	20.1
All other causes	70	38.1
Total	184	100.0

At ages 45 to 64 the principal cause of death was accidents, resulting in a proportionate mortality of 15 per cent, followed by tuberculosis of the lungs with 10.7 per cent, and apoplexy with 9.7 per cent. At ages 65 and over the most important cause of death was Bright's disease, or 11 per cent, followed by pneumonia with 10.5 per cent and apoplexy with 9.5 per cent.

Electric-railway employees.—In the experience under consideration the number of deaths of electric-railway employees was 736. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 46.2 per cent, followed by accidents with 15.2 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 35.4 per cent, followed by accidents with 16.9 per cent. The facts in detail for this age group are given in tabular form:

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Proportionate mortality of electric-railway employees (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	138	35.4
Accident	66	16.9
All other causes	186	47.7
Total	390	100.0

At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 13.7 per cent of the mortality from all causes in this age group, followed by pneumonia with 11.5 per cent, Bright's disease with 11.5 per cent, and accidents with 11.5 per cent. At ages 65 and over the number of deaths was too small for safe conclusions.

Electric linemen.—In the experience under consideration the number of deaths of electric linemen was only 205. At ages 15 to 24 the principal cause of death was accidents, resulting in a proportionate mortality of 66.7 per cent of the mortality from all causes in this age group, followed by tuberculosis of the lungs with 10.4 per cent. At ages 25 to 44 the most important cause of death was accidents, resulting in a proportionate mortality of 45.3 per cent, followed by tuberculosis of the lungs with 23.4 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of electric linemen (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Accident	58	45.3
Tuberculosis of the lungs	30	23.4
All other causes	40	31.3
Total	128	100.0

At ages 45 to 64 the number of deaths was rather small for safe conclusions, but the principal cause of death was accidents, resulting in a proportionate mortality of 29.6 per cent, followed by tuberculosis of the lungs with 11.1 per cent of the mortality from all causes in this age group. At ages 65 and over the number of deaths was too small for safe conclusions.

Longshoremen and stevedores.—In the experience under consideration the number of deaths of longshoremen and stevedores was 367. At ages 15 to 24 the number of deaths was too small for safe conclusions, but the principal cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 44.4 per cent of the mortality from all causes in this age group. At ages 25 to 44 the

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most important cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 40.3 per cent, followed by accidents with 13.6 per cent and pneumonia with 13.1 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of longshoremen and stevedores (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	79	40.3
Accident	26	13.6
Pneumonia	25	13.1
All other causes	61	33.0
Total	191	100.0

At ages 45 to 64 the principal cause of death was Bright's disease, resulting in a proportionate mortality of 19.3 per cent of the mortality from all causes in this age group, followed by tuberculosis of the lungs with 18.5 per cent and pneumonia with 14.8 per cent. At ages 65 and over the most important cause of death was valvular disease of the heart with 21.8 per cent, followed by pneumonia with 15.6 per cent.

Policemen.—In the experience under consideration the number of deaths of policemen was 377. At ages 15 to 24 the number of deaths was too small for a safe conclusion, but the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 50 per cent of the mortality from all causes in this age group. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 24.9 per cent of the mortality from all causes in this age group, followed by Bright's disease with 14.8 per cent and pneumonia with 12.4 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of policemen (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	42	24.9
Bright's disease	25	14.8
Pneumonia	21	12.4
All other causes	81	47.9
Total	169	100.0

At ages 45 to 64 the principal cause of death was Bright's disease, resulting in a proportionate mortality of 15.8 per cent of the mortality from all causes in this age group, followed by apoplexy, with 9.5 per cent, tuberculosis of the lungs, with 8.9 per cent, and cancer, also

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with 8.9 per cent. At ages 65 and over the most important cause of death was valvular disease of the heart, with 20.5 per cent, followed by Bright's disease, with 11.4 per cent, and apoplexy, with 9.1 per cent.

Printers.—In the experience under consideration the number of deaths of printers was 1,001. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 48.4 per cent of the mortality from all causes in this age group, followed by accidents, with 8.8 per cent, and pneumonia, with 8.4 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 48.6 per cent of the mortality from all causes in this age group, followed by pneumonia, with 7.2 per cent, accidents, with 6.7 per cent, and Bright's disease, with 5.3 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of printers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	210	48.6
Pneumonia	31	7.2
Accident	29	6.7
Bright's disease	23	5.3
All other causes	139	32.2
Total	432	100.0

At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 21.9 per cent of the mortality from all causes in this age group, followed by Bright's disease, with 12.6 per cent, and pneumonia, with 9.2 per cent. At ages 65 and over the most important cause of death was apoplexy, with 17.6 per cent, followed by Bright's disease, with 14.1 per cent, and valvular disease of the heart, with 12.9 per cent.

Molders.—In the experience under consideration the number of deaths of molders, including both floor and bench molders, was 920. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, resulting in a proportionate mortality from all causes in this age group of 22 per cent, followed by accidents, with 20.7 per cent, and pneumonia, with 15.9 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 35.1 per cent of the mortality from all causes in this age group, followed by pneumonia, with 11.6 per cent, and accidents, with 9.9 per cent. The facts, in detail, for this age group are given in tabular form:

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Proportionate mortality of molders (ages 25 to 44 years).

Cause of death.	Number deaths.	Per cent of total.
Tuberculosis of the lungs	124	35.1
Pneumonia	41	11.6
Accident	35	9.9
All other causes	153	43.4
Total	353	100.0

At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 19.3 per cent of the mortality from all causes in this age group, followed by Bright's disease, with 14 per cent, and pneumonia, with 12.9 per cent. At ages 65 and over the most important causes of death were Bright's disease and valvular disease of the heart, each with a proportionate mortality of 14.8 per cent, followed by apoplexy, with 9.8 per cent.

Machinists.—In the experience under consideration the number of deaths of machinists was 2,632. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 39.3 per cent of the mortality from all causes in this age group, followed by accidents, with 17.8 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 40 per cent of the mortality from all causes in this age group, followed by accidents, with 10.5 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of machinists (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	389	40.0
Accident	102	10.5
All other causes	482	49.5
Total	973	100.0

At ages 45 to 64 the principal cause of death was Bright's disease, with a resulting proportionate mortality of 14.1 per cent of the mortality from all causes in this age group, followed by tuberculosis of the lungs, with 14 per cent, and pneumonia, with 8.6 per cent. At ages 65 and over the most important cause of death was Bright's disease, with 11.7 per cent, followed by apoplexy, with 11.4 per cent, valvular disease of the heart, with 10.8 per cent, and cancer, with 8.7 per cent.

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Textile workers.—In the experience under consideration the number of deaths of textile workers was 1,587. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 38.6 per cent of the mortality from all causes in this age group, followed by accidents, with 13.9 per cent, and typhoid fever, with 8.5 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 45.5 per cent, followed by accidents, with 8.1 per cent, and pneumonia, with 6.7 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of textile workers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	230	45.5
Accidents	41	8.1
Pneumonia	34	6.7
All other causes	200	39.7
Total	505	100.0

At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 19.1 per cent of the mortality from all causes, followed by Bright's disease with 14.5 per cent and pneumonia with 10.8 per cent. At ages 65 and over the most important cause of death was apoplexy, with a proportionate mortality of 13.3 per cent, followed by Bright's disease with 12.3 per cent, and valvular disease of the heart with 11.6 per cent.

Hatters.—In the experience under consideration the number of deaths of hatters was 365. At ages 15 to 24 the number of deaths was rather small for safe conclusions, but the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality in this age group of 42.9 per cent. At ages 25 to 44 the most important cause was tuberculosis of the lungs, with a proportionate mortality of 52.3 per cent, followed by Bright's disease with 8.7 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of hatters (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	78	52.3
Bright's disease	13	8.7
All other causes	58	39.0
Total	149	100.0

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At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 20.4 per cent, followed by Bright's disease with 12.1 per cent, and valvular disease of the heart with 10.6 per cent. At ages 65 and over the most important cause of death was apoplexy, with 14.3 per cent, followed by Bright's disease with 12.5 per cent.

Glassworkers.—In the experience under consideration the number of deaths of glassworkers was 465. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 38.5 per cent of the mortality from all causes in this age group, followed by accidents with 13.8 per cent, and typhoid fever with 9.2 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 48.1 per cent, followed by Bright's disease with 7.2 per cent, and accidents with 6.1 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of glassworkers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	87	48.1
Bright's disease	13	7.2
Accidents	11	6.1
All other causes	70	38.6
Total	181	100.0

At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 17.8 per cent, followed by Bright's disease with 15.3 per cent, and pneumonia with 9.3 per cent. At ages 65 and over the most important cause of death was Bright's disease, with a proportionate mortality of 16.1 per cent, followed by apoplexy and pneumonia, each with 12.5 per cent. The number of deaths in this age group are rather too small for safe conclusions.

Stoneworkers.—In the experience under consideration the number of deaths of stoneworkers, including marble and stone cutters, was 534. At ages 15 to 24 the number of deaths was too small for safe conclusions, but the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 33.3 per cent of the mortality from all causes in this age group. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 47.8 per cent of the mortality from all causes in this age group, followed by Bright's disease with 8.3 per cent, and pneumonia and accidents, each with 6.4 per cent. The facts in detail for this age group are given in tabular form:

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Proportionate mortality of stoneworkers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	75	47.8
Bright's disease	13	8.3
Pneumonia	10	6.4
Accident	10	6.4
All other	49	31.1
Total	157	100.0

At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 32 per cent, followed by Bright's disease with 9.7 per cent, and pneumonia with 7.8 per cent. At ages 65 and over the most important causes of death were tuberculosis of the lungs with a proportionate mortality of 14 per cent, and Bright's disease also with 14 per cent, followed by valvular disease of the heart with 9.7 per cent, apoplexy with 6.6 per cent, and heart disease with 7.5 per cent.

Bakers.—In the experience under consideration the number of deaths of bakers was 729. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 24.1 per cent of the mortality from all causes in this age group, followed by accidents with 11.1 per cent, and typhoid fever with 9.3 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 37.2 per cent, followed by pneumonia with 12.1 per cent, and Bright's disease with 8.2 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of bakers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	77	37.2
Pneumonia	25	12.1
Bright's disease	17	8.2
All other causes	88	42.5
Total	207	100.0

At ages 45 to 64 the principal cause of death was Bright's disease, with a resulting proportionate mortality of 15.2 per cent, followed by tuberculosis of the lungs with 13 per cent, and apoplexy with 9.3 per cent. At ages 65 and over the most important cause of death was Bright's disease, with a proportionate mortality of 20.5 per cent, followed by apoplexy with 10.3 per cent, and pneumonia with 9.6 per cent.

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Cigarmakers.—In the experience under consideration the number of deaths of cigarmakers was 739. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 54.8 per cent of the mortality from all causes in this age group, followed by accidents with 9.6 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 45 per cent, followed by Bright's disease with 7.4 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of cigarmakers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	85	45.0
Bright's disease	14	7.4
All other causes	90	47.6
Total	189	100.0

At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 18.9 per cent, followed by Bright's disease with 15.2 per cent, cancer with 7.8 per cent, and liver diseases also with 7.8 per cent. At ages 65 and over the most important cause of death was Bright's disease, with a proportionate mortality of 13.5 per cent, followed by valvular disease of the heart with 12.3 per cent, and cancer with 9 per cent.

Coopers.—In the experience under consideration the number of deaths of coopers was 508. At ages 15 to 24 the principal causes of death were tuberculosis of the lungs, and accidents, each with a proportionate mortality of 27.3 per cent of the mortality from all causes in this age group, but the number of deaths in this group was too small for safe conclusions. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 39.6 per cent, followed by pneumonia with 10 per cent, and Bright's disease and accidents each with 7.2 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of coopers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	44	39.6
Pneumonia	11	10.0
Bright's disease	8	7.2
Accident	8	7.2
All other causes	40	36.0
Total	111	100.0

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At ages 45 to 64 the principal cause of death was tuberculosis of the lungs, with a resulting proportionate mortality of 21.5 per cent, followed by pneumonia with 10.7 per cent, and Bright's disease with 10.2 per cent. At ages 65 and over the most important cause of death was apoplexy, with a proportionate mortality of 12.7 per cent, followed by Bright's disease with 10.5 per cent, pneumonia with 9.9 per cent, and cancer with 8.3 per cent.

Painters.—In the experience under consideration the number of deaths of painters was 2,783. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 34.7 per cent of the mortality from all causes in this age group, followed by accidents with 22.6 per cent, and typhoid fever with 7 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 39.2 per cent, followed by Bright's disease with 10.5 per cent, and accidents with 10 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of painters (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	387	39.2
Bright's disease	104	10.5
Accident	99	10.0
All other causes	397	40.3
Total	987	100.0

At ages 45 to 64 the principal cause of death was Bright's disease, with a resulting proportionate mortality of 17.9 per cent, followed by tuberculosis of the lungs with 15.4 per cent, apoplexy with 8.2 per cent, and pneumonia with 8.1 per cent. At ages 65 and over the most important cause of death was Bright's disease, with a proportionate mortality of 18.9 per cent, followed by apoplexy with 16.8 per cent, and valvular disease of the heart with 10.9 per cent.

The proportionate mortality from lead poisoning in this occupation was 2 per cent at ages 15 to 24, 1.7 per cent at ages 25 to 44, 1.5 per cent at ages 45 to 64, and 0.7 per cent at ages 65 and over.

Plumbers.—In the experience under consideration the number of deaths of plumbers was 1,133. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 32.8 per cent of the mortality from all causes in this age group, followed by accidents with 19.3 per cent, and digestive diseases with 8.5 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 41.7 per cent, followed by accidents with 10.6 per cent, and

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Bright's disease with 8.4 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of plumbers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	268	41.7
Accident	68	10.6
Bright's disease	54	8.4
All other causes	252	39.3
Total	642	100.0

At ages 45 to 64 the principal cause of death was Bright's disease, with a resulting proportionate mortality of 17.3 per cent, followed by tuberculosis of the lungs with 16.2 per cent, and accidents with 10.8 per cent. At ages 65 and over, the most important cause of death was Bright's disease, with a proportionate mortality of 25.9 per cent, followed by apoplexy with 20.3 per cent, and cancer with 13 per cent.

There were no deaths from lead poisoning among plumbers, but lead may have been a contributory cause in the relatively high proportionate mortality from digestive diseases at ages 15 to 24, or 8.5 per cent of the mortality from all causes, and at 65 and over, or 11.1 per cent.

Bar tenders.—In the experience under consideration the number of deaths of bar tenders was 1,163. At ages 15 to 24 the principal cause of death was tuberculosis of the lungs, with a proportionate mortality of 34.1 per cent of the mortality from all causes in this age group, followed by Bright's disease with 11.4 per cent, and accidents with 9.1 per cent. At ages 25 to 44 the most important cause of death was tuberculosis of the lungs, with a proportionate mortality of 35.7 per cent, followed by Bright's disease with 9.1 per cent, pneumonia with 9 per cent, and alcoholism with 7.7 per cent. The facts, in detail, for this age group are given in tabular form below:

Proportionate mortality of bar tenders (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	301	35.7
Bright's disease	77	9.1
Pneumonia	76	9.0
Alcoholism	65	7.7
All other causes	325	38.5
Total	844	100.0

At ages 45 to 64 the principal cause of death was Bright's disease, with a resulting proportionate mortality of 16.2 per cent, followed by tuberculosis of the lungs with 15.4 per cent, pneumonia with 10

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per cent, and liver diseases with 8.5 per cent. At ages 65 and over the number of deaths was too small for a safe conclusion, but the most important cause of death was pneumonia, with a proportionate mortality of 18.8 per cent.

Saloon keepers.—In the experience under consideration the number of deaths of saloon keepers was 665. At ages 15 to 24 the number of deaths was too small for a safe conclusion, but it is suggestive that the only death which occurred was from liver disease. At ages 25 to 44 the principal cause of death was tuberculosis of the lungs, resulting in a proportionate mortality of 26.9 per cent of the mortality from all causes in this age group, followed by Bright's disease with 11.5 per cent, liver diseases with 9.6 per cent, pneumonia with 8.8 per cent, and alcoholism with 6.2 per cent. The facts in detail for this age group are given in tabular form below:

Proportionate mortality of saloon keepers (ages 25 to 44 years).

Cause of death.	Number of deaths.	Per cent of total.
Tuberculosis of the lungs	87	26.9
Bright's disease	37	11.5
Liver diseases	31	9.6
Pneumonia	28	8.8
Alcoholism	20	6.2
All other causes	122	37.8
Total	323	100.0

At ages 45 to 64 the principal cause of death was Bright's disease, or 20.5 per cent of the mortality from all causes in this age group, followed by liver diseases with 12.1 per cent and tuberculosis of the lungs with 9.1 per cent. At ages 65 and over the principal cause of death was Bright's disease with 17.6 per cent, followed by liver diseases with 14.7 per cent, and cancer, heart disease, and pneumonia with 8.0 per cent each.

The foregoing discussion is not intended as a final statement of the facts regarding occupational mortality in the United States, as derived from life-insurance experience. The discussion is rather for the purpose of emphasizing the practical utility of the proportionate mortality and the importance of accidents and tuberculosis as the two principal causes of death in the mortality of persons employed in industrial pursuits. In addition thereto the discussion brings out the excessive mortality from liver diseases among bar tenders and saloon keepers, than which there could be no more conclusive proof of the relation between drinking habits and longevity. All of the statistical tables in full detail for specified occupations have been printed in pamphlet form as "Exhibits of the Prudential Insurance Company of America, Fifteenth International Congress

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on Hygiene and Demography." A copy of this publication can be obtained free of charge on application to the company's secretary, Newark, N. J.

INHERENT LIMITATIONS OF OCCUPATIONAL STATISTICS.

I have tried to emphasize in the foregoing discussion the practical utility of occupational-mortality statistics and the possibilities of fruitful research in a field which heretofore has been much neglected by the students of social and economic conditions in the United States. I am well aware of the inherent limitations of occupational-mortality statistics, which require to be amplified by trustworthy morbidity statistics; but practically the only available material of this kind is to be derived from an analysis of hospital returns, the sickness experience of labor organizations and personal-accident insurance companies transacting a so-called health-insurance business. Unfortunately this experience has not been made public. Obviously it would be impossible to cover so vast a field adequately in the present discussion. In the light of my own experience I am so thoroughly convinced of the practical value of the proportionate mortality figure, which is applicable alike to official mortality statistics and data derived from the experience of insurance companies, labor organizations, industrial corporations, etc., that I have felt justified in fully emphasizing the utility of this method of analysis as perhaps the most useful in modern methods of research into the underlying causes and conditions which make for ill health and short life among the men and women employed in American industry.

AMERICAN PROGRESS IN INDUSTRIAL HYGIENE.

A full account of what has been done, or is being done, in the field of industrial hygiene in the United States during recent years, or at the present time, does not fall within the scope of this discussion. The first scientific investigation into the occurrence of industrial diseases was made in the State of Massachusetts and published in the form of an appendix to the annual report of the State board of health in 1907. Subsequent to that investigation State inspectors of health were appointed, and this work has been of much practical value. In 1910 a special report on dusty trades in Massachusetts was published by the same authority, with many illustrations emphasizing health-injurious processes and occupations injurious to the health of minors under 18 years of age. Occupational diseases have also been investigated and reported upon in considerable detail by the Bureau of Labor of the State of New York, attached to which is a medical inspector, who has rendered conspicuous

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service to the cause of industrial hygiene and the ascertainment of health-injurious conditions in the industries of that State. Occasional investigations have been made by the Bureau of Statistics of Labor and Industries of the State of New Jersey, the work of which will be made much more effective in the near future. Foremost among the agencies directing public attention to health-injurious occupations stands the American Association for Labor Legislation, which has actively and successfully exerted itself in bringing about the enactment of a Federal law prohibiting the manufacture of poisonous matches. Under the auspices of the association several congresses on industrial diseases have been held, and upon its initiative a committee was appointed to present a memorial on the subject of occupational diseases to the President of the United States, suggesting the appointment of a national commission of inquiry into the whole subject.

The work, however, which has been truly national in character and most useful for practical purposes, has been done by the Federal Bureau of Labor, which has published a number of important reports on industrial hygiene and the results of special investigations into the mortality from consumption in dusty trades, phosphorus poisoning, lead poisoning, etc. Mention requires also to be made of the report of the Commission on Occupational Diseases of the State of Illinois, which includes the results of original inquiries into the occurrence of lead poisoning, brass-workers' ague, carbon-monoxide poisoning, compressed-air disease, etc. Aside from these official investigations a large amount of useful work has been done, and is being done, through private initiative or associated effort more or less sustained by private philanthropy. As a particularly suggestive modern tendency, mention may be made of the sanitary board of the suit and cloak industry, and the work of the American Museum of Safety, which maintains exhibits on subjects of industrial hygiene amplified by illustrated lectures emphasizing in the most practical manner the measures and means by which health and safety in American industry may be materially improved. During recent years, therefore, America has contributed a considerable amount of valuable material to the study of questions and problems in industrial hygiene, and the excellent beginning which has been made foreshadows still more valuable results in the near future.

THE INDUSTRIAL ACCIDENT PROBLEM.

The industrial accident problem has also only of late years attracted much public attention in the United States, and its present importance is largely because of the enactment of more or less drastic workmen's compensation legislation. The previous extended con-

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sideration of occupational mortality precludes an adequate discussion of fatal industrial accidents, the number of which in the United States is approximately 25,000. In addition thereto, however, it may be conservatively estimated that there are 15,000 fatal accidents not directly attributable to industry, or, in other words, about 40,000 fatal accidents occur annually in the United States among approximately 30,000,000 males employed in gainful occupations. This estimate has been arrived at upon the basis of a careful analysis of all the available information with regard to every branch of industry. For the most dangerous trades, such as employment on railways and in mines, there are, of course, the official statistics of fatal and non-fatal accidents, but for most of the occupations there are no really trustworthy returns aside from the occupational mortality data of the census of 1900, limited to the registration States. The estimate of 25,000 fatal industrial accidents is confirmed by a careful study of industrial insurance mortality statistics and a special analysis of the more or less trustworthy statistical reports for certain States and municipalities. I have also taken into account the reports of workmen's benefit insurance associations, as well as the proportionate mortality from accidents disclosed by the analysis of the Census Office for 1908–9. According to these sources, the estimate of 25,000 fatal accidents in American industry as the result of occupational activity is in all probability quite conservative. This number of fatal accidents would be equivalent to a rate of 0.83 per 1,000 employed; and if in addition thereto the 15,000 accidents from non-industrial sources are considered, the total fatal-accident rate of occupied males would be 1.33 per 1,000 for the United States during the year 1912. Since according to the census of 1900 the total death rate as calculated for that year was 15 per 1,000 for occupied males, it is evident that the rate assumed in the present calculation practically conforms to the experience data for the year 1900 and the two years of registration returns for 1908–9, according to which the proportionate mortality from accidents was 10.5 per cent for occupied males in the registration area.

ACCIDENTS ON RAILWAYS.

In the American railway service the number of fatal accidents to employees in 1911 was 3,414, but as far as known this number is exclusive of employees on railways not engaged in interstate traffic. The fatal accident rate was 2.01 per 1,000 employed, which is considerably less than the corresponding rate of 2.8 per 1,000 for 1904, which represents the maximum rate since 1900. It requires to be taken into account that the fatality rate, as determined by the Interstate Commerce Commission, is exclusive of deaths occurring after 24 hours from the time of accident. Upon a conservative basis, it is

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estimated that the rate would be increased by from 10 to 15 per cent if deaths of employees were included which occur after 24 hours from the time of accident.

Fatal accident rates of railway employees in general fail to disclose the true hazard of this occupation. The rate for railway trainmen, considered as a group, is considerably above the average for all employees, and in 1909 the rate was 4.9 per 1,000. The rate has materially decreased since 1904, when it was 8.3 per 1,000. The decrease is unquestionably attributable to the introduction of effective safety devices, chiefly with regard to the automatic coupling of cars. There also has been a substantial reduction in the fatality rate of switch tenders and flagmen, since for this group the rate in 1909 was only 2.1 per 1,000, against a maximum rate of 5.7 in 1903. This reduction is partly attributable to the gradual elimination of the most dangerous grade crossings, and also, of course, to the introduction of the block system or the automatic operation of gates and switches from signal towers.

In the Railway Mail Service the average fatality rate is about 1 per 1,000 employed. During the five years ending with 1911 the rate was 1.02 per 1,000. The rate has been as high as 1.6 per 1,000 in 1910, and 2.1 per 1,000 in 1908.

ACCIDENTS IN MINES.

The fatality rate in metal mines is approximately 3 per 1,000 employed. During the five years ending with 1910 the average fatality rate for the gold and silver mines of Colorado was 2.3 per 1,000, for the lead and zinc mines of Missouri it was 3.4, for the iron-ore mines of Marquette County, Mich., it was 4.2, and for the metal mines of Montana it was 2.9 per 1,000.

The average fatality rate in the coal mines of North America was 3.6 per 1,000 during the decade ending with 1910. The rate reached its maximum in American mining history in the year 1910, when it attained to 4.18 per 1,000. Considered by quinquennial periods, the rate has increased from 2.46 per 1,000 in 1886–1890 to 3.76 in 1906–1910. The fatality rate in coal mining in North America is approximately twice as high as the corresponding rate for the coal-mining countries of Europe.

ACCIDENTS IN NAVIGATION.

There are no trustworthy statistics of fatal accidents in American navigation, including the fisheries. For some years returns have been privately compiled annually for the Gloucester fisheries, and for the decade ending with 1906 the fatality rate was 11.7 per 1,000

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employed. The accident liability of men employed in navigation on inland lakes, rivers, bays, along the coasts, and on the high seas is a most neglected phase of the accident problem in America to-day. It is difficult to understand why the Federal Government should not have complete jurisdiction over all vessels engaged in inland or coastwise navigation, at least with regard to the reporting of fatalities to all persons employed in navigation. The returns published by the Supervising Inspector General of the Steamboat-Inspection Service, as well as the reports of the United States Life-Saving Service, are of no practical value with regard to the accident problem as it affects persons employed in navigation. Since the number of men employed in American fisheries is about 150,000, and in transportation by water about the same number, the accident liability of these classes is certainly an item of considerable social and economic importance.

ACCIDENTS IN THE ELECTRICAL INDUSTRIES.

There are also no trustworthy data for the electrical industries, which within recent years have assumed considerable importance. The Board of Gas and Electric Light Commissioners of Massachusetts makes public each year a report which is of some value, but it may be questioned whether the returns are entirely complete. For street and electric railways the Census Office has made public a statement for the year 1907, according to which 297 employees were killed during that year, against 122 killed in 1902. The number of employees injured was 8,937 in 1907, against 3,699 in 1902. On the basis of the number employed the fatality rate was 1.3 per 1,000 employed in 1907, against 0.9 in 1902. The rate is suggestive of a higher occupational hazard in the employment of street-car conductors and motormen than has been generally assumed.

It is a matter of regret that there should be no returns with regard to industrial accidents in the operation of central electric light and power stations. According to the special census report for 1910, the number of wage earners employed in this branch of industry has increased from 23,330 in 1902 to 34,642 in 1907. It is to be hoped that in the future the census reports on this industry will include a statement of the fatal and nonfatal accidents among employees in this industry.

ACCIDENTS TO FIREMEN AND POLICEMEN.

As an illustration of a dangerous employment with regard to which exact information is most desirable, reference may be made to the accident liability of the employees of the New York fire department. During the period 1902–1911 the fatality rate due to the occupation has been 2.3 per 1,000 employed, having been, respectively,

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2.7 for assistant foremen and men above that grade, and 2.2 per 1,000 for firemen, engineers, and other employees. According to a special investigation for the period 1901–1906, and including the paid fire department forces of the principal American cities, the average fatality rate was 1.9 per 1,000, due to accidents while on duty, and 0.5 per 1,000, due to accidents while off duty, or 2.4 per 1,000 on account of accidents from all causes.

A similar investigation into the accident liability of policemen of American cities for the period 1901–1906 brought out the fact that the fatal accident rate was 0.4 due to accidents while on duty, 0.4 due to homicide while on duty, and 0.1 per 1,000 due to accidents while off duty, or a total death rate from violence, excluding suicide, of 0.9 per 1,000.

PROPORTIONATE MORTALITY FROM ACCIDENTS.

In its final analysis, the proportionate mortality from accidents furnishes the most conclusive evidence of their economic and social significance. According to the Prudential's industrial experience for the four years ending with 1910, the proportionate mortality from accidents among occupied males, ages 15 and over, in the mortality from all causes, was 9.3 per cent; at ages 15 to 24 the proportion of deaths from accidents was 20.4 per cent; at ages 25 to 34 it was 12.8 per cent; at ages 35 to 44 it was 9.8 per cent; and at ages 45 to 54 it was 8.8 per cent. In the mortality of coal miners the proportion of deaths from accidents was 22.9 per cent at ages 15 and over, but at ages 15 to 24 the proportion was 58.1 per cent; at ages 25 to 34 it was 42.9 per cent; at ages 35 to 44 it was 34.7 per cent; and at ages 45 to 54 it was 21.3 per cent. Among railway brakemen the proportion of deaths from accidents at ages 15 and over was 63.3 per cent of the mortality from all causes; at ages 15 to 24 the proportion was 77.2 per cent; at ages 25 to 34 it was 67.2 per cent; at ages 35 to 44 it was 41.3 per cent; and at ages 45 to 54 it was 53.6 per cent. Among electric linemen the proportion of deaths from fatal accidents in the mortality from all causes at ages 15 and over was 48.3 per cent; at ages 15 to 24 it was 66.7 per cent; at ages 25 to 34 it was 51.9 per cent; at ages 35 to 44 it was 34.7 per cent; and at ages 45 to 54 it was 40 per cent. Among laborers generally the proportion of deaths from accidents in the mortality from all causes at ages 15 and over was 9.2 per cent; at ages 15 to 24 it was 22 per cent; at ages 25 to 34 it was 13.9 per cent; at ages 35 to 44 it was 10.6 per cent; and at ages 45 to 54 it was 10.3 per cent.

It is thus brought out by means of the proportionate mortality that the burden of fatal accidents falls most heavily upon the earlier

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years of life, when premature death is a social and economic calamity. The proportionate mortality from accidents also emphasizes the practical importance of preventive measures as well as the humanitarian duty and social responsibility for the introduction of safety devices consistent with economical and efficient industrial operations.

This brief résumé does scant justice to what is properly considered one of the most important phases of the labor problem of to-day. It is something very considerably to the credit of American industry that within recent years so much should have been done to bring about a decided improvement in the conditions under which work can be carried on with least injury to life and health. It requires no extended knowledge of the actual conditions to sustain the conclusion that the responsibility of employers with regard to accident prevention is to-day much more generally recognized among large employers of labor than among those who carry on industry in a small way. It also may safely be asserted that the large American industrial establishments of to-day challenge favorable comparison as to safety and health conditions with corresponding establishments throughout the world. The beginning which has been made warrants the anticipation that much more attention will be paid to the requirements of industrial hygiene and the prevention of industrial accidents in the future than has been the case in the past.

SUMMARY OF CONCLUSIONS.

The foregoing discussion may be briefly summarized as follows:

1. The most urgent requirements for the needs of industrial hygiene in the United States are accurate and complete records of industrial diseases and industrial accidents, and voluntary or compulsory reports thereof should be made to either the State bureaus of labor or the State boards of health.

2. The forms and blanks required for compulsory or voluntary notification should be agreed upon by a national committee, and as far as practicable such forms should be uniform for all the States.

3. The official statistics of occupational mortality should be made public by means of improved methods of tabulation and analysis. Since the calculation of death rates for a large number of specific occupations is a most difficult task, it would seem that the proportionate method of mortality is best adapted for practical requirements, in view of its simplicity and the convenient accessibility of the original facts. The value of this method, however, could be materially increased by the use of the Budapest system of death classification.

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4. As an urgent requirement for the needs of industrial hygiene and the problem of industrial accident prevention, a special analysis should be made by official authority of the mortality by principal occupations for the industrial centers of the United States as illustrated in the present discussion of the vital statistics of copper miners in the city of Butte, Mont.

5. The mortality experience of life insurance companies by occupations as well as the corresponding experience of companies transacting a personal accident, health, and liability insurance business should be made public to a larger extent than heretofore has been the case. The practical value of the proportionate mortality method is amply illustrated in the analysis of the occupational mortality statistics of the Prudential Insurance Co. of America exhibited at the International Congress on Tuberculosis in 1908 and in more detail on the occasion of the Fifteenth International Congress on Hygiene and Demography.

6. The experience data of hospitals, workmen's benefit associations, and the sickness departments of national and local labor organizations would also prove a most valuable addition to the at present very limited amount of trustworthy information regarding the morbidity from important causes in representative trades and specific occupations. The practical value of this method of analysis is precisely shown in a brief reference to the experience of the Cambria Mutual Benefit Association.

7. Statistics of occupational mortality and morbidity should invariably be given with distinction of sex and by divisional periods of life, and with a due regard to the principal causes of death. The average age at death is more or less misleading, and the only useful method is to state the cause of death by selected occupations separately for each sex and in detail by divisional periods of life.

8. The field of statistical research requires to be amplified by an intensive study of actual conditions under which dangerous or unhealthful industries are carried on at the present time. The special reports of the Massachusetts State board of health, the New York department of labor statistics, and of the Illinois commission on occupational diseases, as well as the series of monographs on industrial accidents, dusty trades, lead poisoning, phosphorus poisoning, etc., of the Federal Bureau of Labor, are suggestive indications of what is being done in the field of industrial hygiene in the United States to improve the social and economic condition of labor by the ascertainment and subsequent removal of ill health producing conditions in industries and the more or less serious liability to industrial accidents.

9. In due appreciation of the immense importance of all that pertains to the field of industrial hygiene in a nation which is to-day

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foremost in the field of industrial activity, it would seem eminently right and proper that the whole problem of health in industry should be seriously considered by a national commission, in conformity to the principles advanced in the memorial to the President of the United States, and presented to him at the request of the First National Conference on Industrial Diseases, held in Chicago in 1911. A copy of this "Memorial on Occupational Diseases" can be had on application to the American Association for Labor Legislation, 131 East Twenty-third Street., New York City.

10. For the furtherance of the cause of industrial hygiene it would also seem that there should be more intelligent cooperation between existing agencies for social reform, and particularly on the part of national and local associations interested and active in the field of industrial hygiene, including the American Association for Labor Legislation, the National Civic Federation, the American Museum of Safety, the American Public Health Association, the American Medical Association, the National Conference of Bureaus of Labor, the National Conference of Factory Inspectors, the Association of Life Insurance Presidents, and other national bodies of life, accident, and liability insurance companies, the American Association of Manufacturers, and any and all other bodies more or less directly interested in the reduction of the mortality from preventable causes in American industry.

APPENDIX A.—*Mortality of occupied males, by principal causes, 1907–1910.*[a]

[Proportionate mortality by causes and ages.]

Cause of death.	Ages 15 and over.		Ages 15–24.		Ages 25–34.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Typhoid	1,857	1.8	733	6.8	517	3.3
Alcoholism	1,522	1.5	16	.1	313	2.0
Cancer	4,413	4.3	52	.5	117	.8
Tuberculosis of lungs	22,097	21.4	3,689	34.3	6,496	42.1
Other tubercular	570	.6	129	1.2	135	.9
Old age	953	.9				
Appoplexy and paralysis	8,057	7.8	103	1.0	300	1.9
Other nervous diseases	2,792	2.7	359	3.3	397	2.6
Heart diseases	9,557	9.2	490	4.6	752	4.9
Pneumonia	9,215	8.9	734	6.8	1,141	7.5
Other respiratory diseases	3,477	3.4	148	1.4	241	1.6
Liver diseases	3,036	2.9	49	.5	240	1.6
Other digestive diseases	4,273	4.1	636	5.9	523	3.4
Urinary diseases	12,387	12.0	401	3.7	1,092	7.1
Accidents	9,607	9.3	2,198	20.4	1,971	12.8
Suicide	2,271	2.2	301	2.8	438	2.8
Lead poisoning	57	.1	4		9	.1
All other causes	7,293	7.1	714	6.6	769	5.0
All causes	103,434	100.0	10,756	100.0	15,451	100.0

[a] Derived from the industrial mortality experience of the Prudential.

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APPENDIX A.—*Mortality of occupied males, by principal causes, 1907–1910* [a]—Con.

[Proportionate mortality by causes and ages.]

Cause of death.	Ages 35–44.		Ages 45–54.		Ages 55–64.		Ages 65 and over.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
Typhoid	288	1.7	201	1.1	86	0.4	33	0.2
Alcoholism	527	3.0	410	2.3	202	1.0	54	.3
Cancer	380	2.2	959	5.3	1,562	7.5	1,343	6.4
Tuberculosis of lungs	5,907	33.9	3,411	19.0	1,908	9.2	686	3.3
Other tubercular	121	.7	80	.4	73	.4	32	.2
Old age	.....	.....	10	.1	97	.5	846	4.0
Appoplexy and paralysis	658	3.8	1,210	6.7	2,440	11.7	3,346	15.9
Other nervous diseases	542	3.1	573	3.2	481	2.3	440	2.1
Heart diseases	1,102	6.3	1,686	9.4	2,502	12.0	3,025	14.4
Pneumonia	1,597	9.2	1,792	10.0	2,038	9.8	1,913	9.1
Other respiratory diseases	392	2.3	562	3.1	969	4.7	1,165	5.5
Liver diseases	568	3.3	851	4.7	839	4.0	489	2.3
Other digestive diseases	534	3.1	662	3.7	921	4.4	997	4.7
Urinary diseases	1,663	9.6	2,378	13.2	3,294	15.8	3,559	16.9
Accidents	1,706	9.8	1,575	8.8	1,296	6.2	861	4.1
Suicide	442	2.5	478	2.7	423	2.0	189	.9
Lead poisoning	16	.1	13	.1	10	.....	5	.....
All other causes	972	5.6	1,181	6.6	1,696	8.1	2,024	9.6
All causes	17,415	100.0	17,969	100.0	20,836	100.0	21,007	100.0

[a] Derived from the industrial mortality experience of the Prudential.

APPENDIX B.—*Proportionate mortality from tuberculosis of the lungs, by ages, 1907–1910.* [a]

Occupation.	Ages 15 and over.		Ages 15–24.		Ages 25–44.		Ages 45–64.		Ages 65 and over.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
All occupied males	22,097	21.4	3,689	34.3	12,408	37.7	5,319	13.7	686	3.3
Farmers	396	9.9	71	26.9	125	32.1	127	9.4	73	3.6
Clerks	1,221	35.5	483	42.4	636	44.8	96	14.2	6	2.8
Bartenders	356	30.7	15	24.1	301	35.7	40	15.4	.....	.....
Saloonkeepers	116	17.4	.....	.....	87	26.9	28	9.1	1	2.9
Coal miners	186	10.8	8	5.2	53	14.1	107	12.2	18	5.7
Iron and steel workers	249	19.3	42	27.9	154	29.7	43	10.8	5	2.7
Railroad brakemen	61	11.4	15	7.4	43	15.3	3	6.1	.....	.....
Electric linemen	38	18.5	5	10.4	30	28.4	3	11.1	.....	.....
Glassworkers	153	32.9	42	38.5	87	48.1	21	17.8	3	5.4
Stoneworkers	179	33.5	5	33.3	75	47.8	86	32.0	13	14.0
Carpenters	742	15.6	54	32.0	331	38.4	298	14.9	59	3.4
Masons	289	17.5	19	31.1	140	39.0	118	15.5	12	2.6
Painters	649	23.3	69	34.7	387	39.2	180	15.4	13	3.1
Plumbers	369	32.6	58	32.8	268	41.7	42	16.2	1	1.9
Printers	377	37.7	104	48.4	210	48.6	59	21.9	4	4.7
Machinists	711	27.0	194	39.3	399	40.0	115	14.0	13	3.8
Bakers	140	19.2	13	24.1	77	37.2	42	13.0	8	5.5
Cigarmakers	194	26.3	40	54.8	85	45.0	61	18.9	8	5.2
Tailors	176	15.2	26	52.0	84	47.5	52	10.4	14	3.2
Textile workers	434	27.3	86	38.6	230	45.5	108	19.1	10	3.4

[a] Derived from the industrial mortality experience of the Prudential.

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APPENDIX C.—*Proportionate mortality from accidents, by ages, 1907–1910.*[a]

Occupation.	Ages 15 and over.		Ages 15–24.		Ages 25–44.		Ages 45–64.		Ages 65 and over.	
	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.	Number.	Per cent.
All occupied males	9,607	9.3	2,198	20.4	3,677	11.2	2,871	7.4	861	4.1
Farmers	234	5.9	42	15.9	44	11.3	85	6.3	63	3.2
Clerks	230	6.7	112	9.8	78	5.5	28	4.1	12	5.7
Bartenders	41	3.5	4	9.1	28	3.3	8	3.1	1	6.3
Saloonkeepers	15	2.3	.....	.....	9	2.8	6	2.0	.....	.....
Coal miners	394	22.9	90	58.1	144	38.3	143	16.4	17	5.3
Iron and steel workers	198	15.3	40	26.7	106	20.5	42	9.4	10	5.4
Railroad brakemen	340	63.3	156	77.2	165	58.7	19	33.3	.....	.....
Electric linemen	99	48.3	32	66.7	58	45.3	8	29.6	1	50.0
Glassworkers	33	7.1	15	13.3	11	6.1	6	5.1	1	1.8
Stoneworkers	25	4.7	3	20.0	10	6.4	11	4.1	1	1.1
Carpenters	369	7.8	32	18.9	105	12.2	169	8.5	63	3.6
Masons	149	9.0	12	19.7	39	10.9	73	9.6	25	5.3
Painters	239	8.6	45	22.6	99	10.0	79	6.8	16	3.8
Plumbers	132	11.7	36	19.3	68	10.6	28	10.3	.....	.....
Printers	57	5.7	19	8.8	29	6.7	7	2.6	2	2.4
Machinists	264	10.0	38	17.3	102	10.5	59	7.2	15	4.4
Bakers	37	5.1	6	11.1	9	4.3	18	5.6	4	2.7
Cigarmakers	45	6.1	7	9.6	11	5.3	18	5.6	9	5.3
Tailors	35	3.0	3	6.0	7	4.0	18	3.6	7	1.6
Textile workers	111	7.0	31	13.9	41	8.1	29	5.1	10	3.4

[a] Derived from the industrial mortality experience of the Prudential.

[1] Eleventh Census of the United States, 1890, Vital Statistics, Part I, p. 61.

[2] Twelfth Census of the United States, 1900, Vital Statistics, Part I, p. cclix.

[3] Since this was written the report for 1909 has been published with the usual table of occupation mortality and the proportionate mortality from principal causes.

[4] A beginning has been made in the City Registrar's report of Providence, R. I., for 1911.

[5] This information was secured for The Prudential Insurance Co. of America.

[6] Reference may be made here to the attention which has been given to local mortality statistics in the reports of the United States Commissioner of Labor on the "Condition of Woman and Child Wage-earners in the United States," and in the special report on the strike at the Bethlehem Steel Works.

REPORTING OF INDUSTRIAL ACCIDENTS.

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It is the purpose in this paper to review the nature and method of the inquiries made by the various States of the United States concerning industrial accidents, with a view to showing the sort of information upon which there is more or less agreement, and with the further purpose of indicating the need for greater uniformity in schedules and for agreement on the essential facts required in reference to accidents. A second aim of the paper is to promote a clearer understanding of the nature of the problems in the solution of which statistical data are essential. Such an understanding is preliminary to the collection of the facts themselves, and should be our guide as to what facts to collect in the future, and how to collect and arrange them. It is recognized that wise legislation for the future is conditioned upon increasing completeness of information.

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1. THE GATHERING OF ACCIDENT STATISTICS BY STATE BUREAUS IN THE UNITED STATES.

In 1904, in Bulletin 54, the Bureau of Labor published a list of subjects of most vital concern to the laboring classes, up to that time investigated by State bureaus of labor. Only four States had attempted to collect data on industrial accidents. Since 1904 interest in the nature, extent, causes, and results of accidents has steadily increased. State departments of factory inspection and mine inspection have been created in many States in response to the demands for more careful supervision of working conditions by the State. Railroad and public-service commissions are requiring reports of injuries occurring in connection with transportation. We are pausing to count the cost in human life of our phenomenal industrial progress, and to formulate policies which regard man as of more importance than wealth where the two interests comes into conflict.

Of the more than 30 States having bureaus of labor and statistics in the United States, over 20 are annually collecting, with varying degrees of completeness, statistics of industrial accidents. Some collect regularly, as required by law, only the record of injuries in mines; others only the record of accidents in factories; and most of the States fail to collect for all dangerous industries. It has seemed worth while to make tabulation for 19 States, showing the sort of inquiries made, what facts concerning accidents were required by the largest number of States, and what facts still remain unknown.

Such tabulation reveals the fact that the 19 States are unanimous in respect to only one inquiry—the name of the injured. Almost all of the States require the date of the accident, the age and exact occupation of the injured, and the cause and nature of the injury. About two-thirds of the States seek information as to the name, location of the plant, and the nature of the business of the employer; the address, sex, and conjugal condition of the injured; the name of the machine or part causing the accident; and the hour of day at which the accident occurred. Only one-fourth of the States ask about the number of hours employed on the day of the accident, and yet this information is of vital importance if we are to judge concerning overstrain and fatigue as a cause of accidents. Somewhat less than one-half the States attempt to ascertain the nationality of the injured; how long the injured has been in the occupation and how long at the particular operation causing injury. Only three States inquire as to whether the injured understood English. About one-third of the States inquire as to the guarding of the thing causing injury and as to whether the employer admits that the accident was due to his fault or that of his agent; or whether he claims that it was due to the willful misconduct or contributory negligence of the injured or to the negligence of a fellow servant.

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Only four States ask the employer to describe the safety device or to make suggestions as to the prevention of future similar accidents. About one-half of the States inquire as to the probable period of disability, the average wage of the injured, and the details as to dependents, while four States ask as to the loss of time in days and two States the loss in wages, and four States attempt to define the extent of the disability, whether it is permanent or temporary, total, or partial. Only one State inquires about physical defects of eye or ear which might have caused the accident, or about the personal habits of the injured. The inquiries do not emphasize enough the person injured, as to his liability to injury through his habits, his physical defects, his inability to understand English, or his attitude toward safety devices. Only two States ask for the names and addresses of witnesses to the accident, and four require the names of the attending physicians. Only one State attempts in its schedule of inquiry to classify injuries in detail. Usually, this is left to the person who tabulates the results.

This analysis shows a great variety of questions asked but far too little agreement upon the essentials required. In order to agree upon the essentials in such an inquiry, it is first necessary to agree upon the sort of problems in the solution of which statistical data may be useful. Before turning attention to the nature of these accident problems certain other matters of prevailing practice among our States should be presented.

2. THE METHOD OF SECURING REPORTS AND THEIR SCOPE.

Who fills out the report of an accident, the employer, an inspector, or a physician? To whom is the report sent? Does it cover all industries or only a part? Are all accidents included or only those of a certain degree of seriousness, and is the specification the same for all States? Is there a penalty for failure to report, and how soon must the report be rendered? Upon the answer to these questions depend the completeness and reliability of such statistical data as our States collect.

The State labor bureaus use largely the method of printed schedules and correspondence, because of the expense attaching to the employment of a force of special agents. In the majority of cases the employer or some one under his direction fills out the schedule. In case any questions are not fully answered the blank is retained for further information, or an inspector of the State department of labor is sent to investigate. Many accidents are not reported even in those occupations where the law requires it, not to mention many occupations, more or less dangerous, which are not required to report. This is indicated by the fact that when the law has been made more stringent by the imposition of more severe penalties it has resulted in a substantial increase in the reported accidents. In Wisconsin it was

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made the duty of physicians to report all accidents which occasioned a disability of two weeks or more. The annual report for 1909–10 questions the completeness of this method, citing as evidence the fact that at least 50 fatal accidents were noted in a Milwaukee paper during the year which were not reported by physicians. In certain European States physicians must report under penalty all accident cases treated, and the injured may not receive compensation until the physician has testified. This law has secured a more complete record of accidents. A similar plan should be adopted in our States, putting accidents on the same plane as certain diseases, especially in the States which have adopted insurance or compensation schemes.

Besides the difficulties which arise from negligence or unwillingness to report injuries, there is more or less confusion as to what department or bureau receives the reports. The law in Illinois originally required that all employers report accidents causing death or 30 days' loss of time to the bureau of labor. A later act, in 1910, required the report to the chief factory inspector from all employers under his jurisdiction covering accidents causing 15 days' loss of time. This later act practically repealed the part of the general act referring to factories. The chief factory inspector then turned over his reports to the bureau of labor for tabulation and report, but this leaves part of the nonfatal accidents in Illinois collected on a basis of 30 days' loss of time and part on a basis of 15 days' loss of time. The result showed at once in an increase of reported accidents. The law of Illinois requires also a report of accidents in mines to the mine inspectors as well as to the labor department. A discrepancy occurs in the figures of the two departments.

The New York commission on employers' liability in its second report finds that it is impossible to state accurately the number of accidents reported in 1910, because each of the three offices receiving reports, i. e., the labor department, the public-service commission of the first district, and that of the second district, has a different system of compiling statistics.

The New Jersey labor office, which does excellent work in wage statistics, reports confusion in the records of accidents. The factory laws of the State require all factory owners to report accidents of a serious character to the factory inspection department. The labor department knows nothing of the observance of this law since no report has yet been made on the subject. In 1911 the legislature required all employers to report accidents to the liability commission, but the law also provides that these reports shall neither be published nor open to public inspection. The labor bureau itself collects reports of accidents from newspaper accounts and publishes these results as a part of its annual report.[1] Enough has been said to indicate the desirability of allowing one State bureau to be the clearing house and place of record for all data on accidents.

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A very serious criticism may be directed against our accident statistics because they do not cover all dangerous occupations. The great industrial State of Pennsylvania has no adequate system of reporting accidents except in the one important industry of coal mining. The bureau of industrial statistics receives some data on accidents, but there is no legal compulsion and the particulars are not given in detail even when reported. The fatal and non-fatal mining accidents are reported to a separate bureau of mines by inspectors and a separate report is issued. From the United States Bureau of Labor reports on the steel industry we know much of the long hours of labor in that industry, but we can not correlate with this information the records of industrial accidents in the industry, because we do not possess the data on accidents.

In New York State the law of 1910 extended the list of occupations in which accidents must be reported to include "building, construction, excavating, and engineering work." During the first four months of its operation 2,530 accidents were reported, 75 of which were fatal. Several more or less dangerous occupations, agriculture, water transportation, teaming, and stevedoring still remain unreported. In the New York liability commission's first report it was estimated, after a careful examination of the cards of coroners' inquests and the records of emergency hospitals, that not more than half of the accidents of employment were at that time reported to any State department. Many other States require only a part of the dangerous occupations to report accidents.

Over half the States requiring reports do not compel that all accidents in the specified occupation be returned, but only those of a certain degree of seriousness. This degree of seriousness is measured usually by loss of time, and varies in different States, from 2 days, or more loss of time in Ohio to 30 days in Illinois. This variability destroys the value of the statistics for purposes of comparison between States.

Most of the States fix a time limit within which report must be made and prescribe a penalty of fine for failure to report. The period varies among the States from immediate to annual report. A standardization of this period would be desirable, since the accuracy with which certain questions could be answered varies with the time elapsed since the accident.

In conclusion it would seem desirable that the records of accidents in all dangerous occupations should be sent to one central office on forms drawn up with as much uniformity as the nature of the occupation will permit and tabulated from year to year, according to the same general scheme. For many States some method of securing more complete returns is especially needed. The accident and occupational-disease problem is one in which the local health and philanthropic agencies are vitally concerned, because upon these agencies

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falls a part of the burden of caring for the serious results of accidents. From the point of view of uniformity of results it is desirable to keep the gathering of accident statistics and the enforcement of law under the control of a State department, but from the point of view of direct and vital interest in the problem of accidents the local agencies ought to assume more responsibility. The great need is for more continuous local cooperation with State authorities in building up a fund of information which will show what the constant human costs in industry are and how present laws are affecting the situation. A clipping bureau, maintained in certain industrial communities, supported jointly by local and State departments, could be of great service as a check upon the completeness of accident reports, and thus secure a better enforcement of the law. The local charitable agencies likewise might do much to secure a prompt report of injuries. Such policies would mean larger direct expenditures by State and localities for the protection of the working classes, but these expenditures would soon be more than repaid by the decreased indirect costs that would result from the prevention of industrial accidents and the formulation of adequate plans for meeting accident burdens.

It can not be too strongly emphasized that the time at which accidents occur is of fundamental importance in understanding the problem. A record of the time of day and the number of hours worked before the accident occurred should be required. This information to be most useful must be gathered by industries and occupations. A report should also be kept of the number employed at day and at night work in each employment at various seasons of the year. From these data it would be possible to determine whether an accident occurs in the course of the normal day's work or during overtime work; whether during the normal work season or during the rush season; whether at night or at day work.

This paper, for lack of time, must simply suggest, without detailed discussion, some of the problems relating to accidents in the solution of which statistical data may be useful or even essential. This affords us an answer to the question as to why we collect the data and what sort of data we ought to require for definite ends. We need more light on the influence of fatigue, which results from long hours and high speed and bad working conditions, in order to find out whether fatigue registers its effects in an increase in the number of accidents. If so, these accidents are preventable. The experience of the injured worker may throw light upon the causes of certain types of accidents. This information could easily be secured. Some say that the experienced worker has by his familiarity with the dangers of his employment become careless and especially liable to accident. This statement is not proved by facts. The whole question of the worker's carelessness needs illumination by facts. In much of our high-speed

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work in industry automatic coordination of movements is the operator's safety. This is often mistaken for carelessness. High speed may be the cause of accidents rather than carelessness. Let us find out.

The nature and duration of the disability must be known in order to understand the nature and extent of the burden imposed by accidents and to apply the principles of insurance in meeting this burden. From the point of view of the prevention of accidents it is very necessary to have exact information upon the mechanical cause of the accident and the nature of the injury, collected by industries. The great need is for some more uniform classification of injuries and causes, so that the facts when gathered may be properly classified. The variety of tabulations in our State reports is confusing. The employer reporting does not know how to describe either the mechanical cause or the injury, and the one who tabulates the reports is likewise at a loss to classify them.

There remain many other problems of industrial accidents, in the solution of which statistical data serve a useful purpose. Thus far, in the discussion of accidents, attention has centered mainly upon the large absolute numbers of injuries and their terrible consequence. Public opinion is being roused, but a careful and scientific knowledge of accidents involves the gathering of the data upon the basis of which accident rates may be calculated. This information we almost totally lack in the United States in sufficient detail to be useful. The previous discussion has shown a serious lack of complete data and the lack of uniform schemes of record and presentation. So much of our scanty material is not comparable from year to year or among the various States.

[1] Since this paper was prepared a new law has been enacted, requiring that accidents be reported to the Labor Department. This removes the objections.

DEMOGRAPHY OF INDUSTRIES AND OCCUPATIONS.

LUCIEN MARCH, Director, General Statistics of France, Paris.

The rapid transformations of production for a century past have resulted in an important change in the conditions of labor, by which life, health, sickness, death rate, and birth rate have been affected.

The former industrial régime in which one producer often did the whole work of production has been succeeded by a régime of great division of labor in which the single producer does only a part, and the total production is the sum of the fragmentary activities of many individuals.

As a result the conditions of personal activity and the conditions of the environment in which the activity is exercised have diverged more and more, while for artisans formerly they were inseparable.

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Rightly assuming that the nature of the work had a marked influence on the laborer's health, morals, and living conditions, the attempt has been made to form occupational groups based upon the nature of this work and to use these groups as a basis for demographic studies. In doing so, the environment in which the work was performed has been neglected, or the desire to neglect it has been felt.

For two main reasons this neglect has been misleading; first, because the influence of environment is not negligible; secondly, because this neglect interferes with accuracy of grouping.

If we wish to compare morbidity and mortality in various occupations, we easily admit that there are some in which the risks are peculiarly important and many others in which the special risk of the occupation is slight compared with that common to all life and not at all conditioned upon the occupation.

In some cases where occupational risks are important the kind of work is individual and the surroundings are not exceptional. This is true of all occupations carried on in the open air, like those of a laborer, carter, and even a builder. In other cases the special work involves a distinct risk. Thus a glass blower works under physical conditions very different from other workmen in the same factory. In still other cases a division of the general environment involves for those who are subject to it peculiar dangers. This is the case, for example, with workmen charged with heating the ovens in a factory where they are exposed to drafts.

But in this case it is the influence of the surroundings and not of the work itself, properly so called, that makes the risk.

The coal heaver in a furnace room is as much exposed to drafts and to the danger of chill as the engineer himself.

In factories where poisonous substances are worked upon, is it the workmen in direct contact with those substances alone that are exposed? In a leather or fur dressing establishment all the workmen, whatever their special occupations, are exposed to the diseases occasioned by germs in the skins worked upon. So, too, manual labor in a fertilizer factory working over harmful residuals is exposed to quite other conditions than manual labor in a glass factory arranging the bottles in the court.

It is the same with industries where the individual occupation hardly offers any special risk compared with the disadvantages of the environment. This is the case, for example, in linen weaving, combing mills, where one lives in a moist atmosphere, or weaving mills, where the atmosphere is loaded with dust, or manufactures of porcelain or of white lead, where lead dust can be absorbed by any workman.

Then we can not undertake a serious demographic study of occupations if we do not take into account both the individual occupation

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and the worker's environment. Consequently, one should not be content with a vague classification according to a man's statement of the kind of work he does. We must know both his individual occupation and the industry of which it is a part.

A second reason for this double requirement is that it is generally impossible from the simple return of an occupation to get a precise idea of the actual laboring conditions and to classify the occupation accurately.

With the exception of perhaps 30 occupations of long standing, which are carried on in many different industries, the simple name of the occupation does not throw much light on the laborer's condition. So in attmepting to form groups according to occupation most classifications actually involve at many points a classification by industries. For example, in the list of occupations in the United States, alongside of those having an individual character and pursued in many different industries, such as joiner and engineer, there are many, such as "other wood workers" and "machinists," which include groups of workmen employed in particular industries, whatever their special occupations may be.

Similar remarks apply to the English statistics of occupation, like those for mortality. Employers, salaried employees, and laborers in a given industry are not distinguished. In the census the carpenters, day laborers, etc., are sometimes combined with and sometimes separated from the industry to which they belong without its being possible to make like distinctions in cases of death.

The most serious disadvantage of a classification not founded on some uniform rule is that it makes possible different interpretations of similar conditions. This would not be very unfortunate for demography if one return gave all the data needed. Then, whatever the group might be, each element of the group would form a homogeneous whole.

But the condition is different; when we are concerned with analyzing the health conditions of an occupation or its economic and social value it is unusual for a single return to furnish all the data. For example, in studying mortality the data are derived partly from the census, partly from the death certificates, and it is necessary that the information derived from these two sources should relate to the same individuals. Likewise in studying longevity, diseases, labor accidents, or unemployment.

By reason of the difficulties in classification according to the individual's occupation and of the similarity of the risks in the same industry, as well as for other reasons of convenience, it has long been a rule in occupational insurance statistics that the basis for occupational groups is found in the collective industry resulting from the

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cooperation of a certain number of persons engaged in various occupations.

This is the surest basis for any occupational classification, the group then being defined legally without any possible ambiguity by the firms or establishments and the location of the establishments included.

Thus, in 1905 the International Statistical Institute recommended that in classifying by occupations persons engaged in any occupation should be classified primarily by the nature of the industry.

When this first classification has been made a second one becomes necessary which distinguishes the several occupations in each industry. This was done to some degree in Germany in 1895, and the effort was made to carry it out completely in France in 1906.

In France the classification of persons according to the industry upon which they were engaged was made with great accuracy, because the schedules of the persons working in a given establishment were grouped together. In this way it was possible to check the statements of the employers and of the laborers against each other.

Instead of obtaining a classification by industries and a classification by individual occupation without any connection between them, they got a single classification, the elements of which fitted into each other.

After the census of 1906 two series of tables were prepared, one in which the persons enumerated were classified according to the industry and another in which the same persons were classified according to their individual occupation.

To get from such tables a good statistics of occupational mortality it would be necessary that the death certificates should cover these points with as much accuracy as the census returns.

The accuracy of the census return was assured by its including the name and address of the establishment where the person worked. A similar declaration should be required in the case of a death, and one would then have at the same time a knowledge of the individual occupation of the decedent in the inaccurate form common to such returns and a knowledge of the industry carried on in the establishment where he worked, in the precise way given by the census.

No doubt in some cases such precision can not be obtained. In cases of death the decedent can not be asked questions. On the other hand, in such cases returns can be gathered by a doctor, with all the detail needed, and the bulletins to be filled out each day are much less numerous than in the case of a census.

We do not have to consider here the practical difficulties which can delay the time when methodical studies of occupational demography will be a reality. I indicate here only the end to be secured,

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and the means which have been employed in France for obtaining it. The principal things to be desired are as follows:

(1) At the census the industry carried on in the establishment where the person works should be exactly determined.

(2) The special occupation, the kind of work of each person engaged in a specific industry, should be determined as well as possible, making use both of the returns and of expert knowledge of the entire industry.[1]

(3) In the various returns used for studying occupational demography, the industry and the individual occupation should be defined with the same precision, and should be subject, if necessary, to reciprocal control.

[1] The combined classification of industries and of occupations has been prepared in thre languages for the Statistique Générale de la France, in its "Repertoire technilogique des industries et professions."

THE MORTALITY FROM ALCOHOL IN THE UNITED STATES—THE RESULTS OF A RECENT INVESTIGATION OF THE CONTRIBUTORY RELATION OF ALCOHOL WITH EACH OF THE ASSIGNED CAUSES OF ADULT MORTALITY.

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INTRODUCTION.

On February 2, 1911, Capt. Richmond P. Hobson, of *Merrimac* fame and of late years a Member of Congress from Alabama, announced on the floor of the House of Representatives his intention of printing in the proceedings a lecture of his on the subject of the effects of alcohol, and this lecture has since been reprinted from the Congressional Record under the title of "The Great Destroyer," has been widely circulated, and has been extensively quoted in public addresses by ministers, physicians, and prohibition advocates. In this speech Capt. Hobson cited alleged English statistics of mortality due to alcohol, undertook to apply them to this country, and thus arrived at the conclusion that "over 680,000 deaths per year in continental United States" are due to alcohol, and that "alcohol is killing our people at the rate of nearly 2,000 men a day every day in the year, as many Americans every year as all the wars of the world have killed in battle in 2,300 years."

At the time of the delivery of this speech by Capt. Hobson the latest available mortality statistics of the United States were those for the calendar year 1909, which were presented in Bulletin 108, then recently issued by the Bureau of the Census. According to this bulletin, the total number of deaths of both sexes, at all ages, from all causes,

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in the registration area of the United States in 1909 was 732,538. Assuming that this death rate for the 55.3 per cent of the population of continental United States included in the registration area was representative of the country at large, this figure would predicate a total mortality of 1,324,662 for the entire country. With this tentative figure as a basis of calculation, Capt. Hobson's assertion that alcohol was responsible for "over 680,000 deaths per year in continental United States" would indicate that 51.3 per cent of all deaths, at all ages, from all causes, in the United States were due to the single factor of alcohol. Even were the presumptive total mortality of the country calculated by doubling the recorded mortality of the registration area—as some statisticians believe should be done, in order to allow for the higher negro mortality of the Southern States not included in the registration area—the total mortality of the United States in 1909 would have been but 1,465,076, and the alleged mortality due to alcohol would have amounted to 46.4 per cent of this total. In short, Capt. Hobson's positive assertion that more than 680,000 deaths in the United States each year were due to alcohol could only be regarded as a declaration that alcohol was annually responsible for approximately one-half of the total mortality of the United States at all ages and from all causes.

The preposterous nature of any such declaration, of course, is apparent on its very face, and I confidently venture the opinion that no man of unbiased mind and ordinary reasoning powers could regard such a statement as entitled to serious consideration. Mark Twain once grotesquely termed the rumor of his death "grossly exaggerated," and Capt. Hobson's statement was of like order. That fact was apparent, and the figure named literally fell by its own weight; but by way of natural sequence there followed the question, to what extent is this figure of 680,000 deaths per year from alcohol in the United States an exaggeration, or, in other words, about how many deaths in this country each year are presumably due to alcohol? No answer to this question was to be found in official figures, the only direct clues in the vital statistics of the Bureau of the Census and the various State and municipal mortality records being the meager returns for deaths directly due to alcoholism, delirium tremens, or the immediate effects of alcohol otherwise classified.

In the last 60 years there have been at least three more or less exhaustive scientific investigations of English mortality due to alcohol, but up to 1911 no investigation worthy of the name in this country, in so far as I was able to ascertain from this country's bibliography of alcohol or by correspondence with some of its principal authorities. In view of the importance and far-reaching ramifications of the subject, and the apparent lack of any credible

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figures, either official or unofficial, it seemed high time that a pioneer effort on these lines should be made. With the kind cooperation of certain eminent medical authorities hereinafter named, I accordingly made the effort in question and published the results of my investigation in book form, under the title of "The Mortality of Alcohol—A Statistical Approximation of the Deaths in the United States in Which Alcohol May Figure as a Causative or Contributory Factor."

THE COMPLEX NATURE OF THE PROBLEM.

The physiological and pathogenic influences of alcohol are a profound, complex, and preeminently debatable problem on which perhaps no two minds, either lay or medical, ever have been in entire accord. Even were every adult death immediately followed by an autopsy there doubtless would be a great many cases of difference of expert medical opinion as to whether in these specific instances alcohol had or had not played any appreciable part in causing death. And surely, in case of a large minority—if not, indeed, in a majority—of deaths nothing short of an autopsy could positively determine the actual importance of alcohol as a mortality factor. For these reasons it is apparent that no man who could authoritatively say precisely how many deaths are directly or indirectly due to alcohol now lives, ever has lived, or ever will live. At best the statistics of the subject, however credible and carefully compiled, can be but mere approximations.

Ruskin made the profound observation that "the work of science is to substitute facts for appearances and demonstrations for impressions," and, measured by these standards, perhaps no approximation of the mortality of alcohol could be regarded as strictly scientific. The most carefully worked-out approximation is open to debate; and facts are not debatable. The subject of alcohol and its use and abuse being one of the most hotly debated topics of modern times, it is patent that no attempt at a serious approximation of the deaths due to alcohol would be received with unanimous approval, whatever the character of its showings. On undertaking the work of trying to arrive at such an approximation by the most promising processes available, I clearly foresaw that any man on publishing to the world the results of his investigation would be confronted with the pleasant choice of the Scylla of prohibition disapproval, or the Charybdis of antiprohibition dissent, according as the resultant figures might prove lower than the former, or higher than the latter, would wish to have them. Some such option is generally one of the prices which must be paid for pioneer work in any field of wide public interest, however, and having secured the necessary expert cooperation I entered on the proposed work without

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either prejudice or suspicion as to its outcome in the way of high or low figures in the approximation of the mortality of alcohol thus deduced—and, I might add, with complete indifference as to the particular horn of the dilemma on which I was destined to be impaled.

To the best of my knowledge, not even a semblance of official figures purporting to present the total number of deaths in which alcohol has played a causative or contributory part in the mortality of the United States now is, or ever has been, obtainable. The returns for deaths due to alcoholism, delirium tremens, etc., of course constitute but one item of that mortality. In Switzerland, as I understand, for several years the official death returns for the cities have been supplemented with confidential reports in cases of adult mortality in which alcohol was a contributory cause of death in the judgment of the attending physician, thus affording at least some means of officially computing the adult urban mortality in which alcohol supposedly figures. As those familiar with "the Budapest system" are aware, the secondary causes of death are entered in the official mortality statistics of that city. With these two exceptions, there are no mortality statistics in any country, in so far as I have been able to learn, which could be regarded as an official measure of the mortality directly or indirectly due to alcohol. It was therefore apparent at the very outset that any investigation of the subject in this country under present conditions must necessarily be entirely without the domain of official statistics. Whence, then, were any figures entitled to serious credence to be sought? That was the first and foremost of the many questions involved.

The subject of the proposed inquiry being so pronouncedly pathologic, obviously the desired information could be obtained only from the medical profession. But from what branch or class of that profession could reliable data be expected? And taking into account the dearth of even unofficial medical records of deaths in the United States in which alcohol had played some part, how was the requisition for information to be framed so as to produce results of any real value? These questions, especially the last named, were of such serious mien as to seem at first thought almost unanswerable. Obviously it would be useless to look to any of the great medical associations, county medical societies, or medical bodies of lesser magnitude for the desired figures or estimates. It was no less clear that even the greatest and most experienced medical and surgical specialists would not be competent witnesses, their several experiences of course having been restricted to their respective lines of practice. To a certain extent this same objection apparently would apply to the house staffs of the great hospitals, for the reason that in their case there would almost certainly be what is known in the insurance world as "adverse selection," or an unquestionable preponderance of

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experience with the lower strata of humanity with exceptional alcoholic leanings. Were the inquiry to be confined to the ranks of "the general practitioner," that sturdy, old-fashioned body of physicians who have done so much to contribute to the health and happiness of the world, the question might arise as to whether these men had the up-to-date, specialized knowledge of the intricacies of the alcoholic problem necessary to qualify them as competent authorities on the subject at issue.

The elimination of these several groups of pathologic and pathogenic authorities had seemed all but to exhaust the entire panel of medical witnesses when it occurred to me that some of my distinguished medical friends occupying the positions of medical directors of great insurance companies might not only be capable of furnishing the desired information, but, as a matter of fact, perhaps the best possible authorities on the subject owing to their extensive experience on wholesale lines, so to speak. I take it that all intelligent men, even without the slightest insurance training or experience, by this time are aware of the fact that all applications for life insurance are finally passed upon by the medical directors of the companies in question, these officials constituting the medical court of last resort in so far as the approval or rejection of the application for insurance is concerned. In a lesser degree this same rule applies to the larger casualty or personal accident insurance companies, and in all applications for life or personal-accident insurance there are certain questions regarding the drinking habits of the applicants whose answers to these questions are made part and parcel of the proposed insurance contracts. Necessarily, therefore, the medical directors of these companies are compelled to keep posted, at least in a general way, on the latest knowledge as to the relations of alcohol and human morbidity and mortality, and hence are constantly in close touch with this phase of the alcoholic problem.

Furthermore, the medical director of a large life or accident company annually passes on many thousands of applications, and, the alcoholic habits or experience of the applicant in each case being an important factor in determining whether the application is to be approved or rejected, the medical director of a well-run insurance company might be said to maintain a closer relation with the actual alcoholic habits of the community at large than does any other class of physicians, with the possible exception of those on the staffs of "gold-cure" establishments. For these reasons I concluded that the medical directors of some of the larger insurance companies might prove exceptionally competent witnesses in the proposed quest for an approximation of the mortality of the United States in which alcohol appreciably figured. The source of the desired information being determined, the next and all-important question

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was just how could the proposed inquiry be so formulated as to bring it within the limitations of the medical directors' field of work and yield tangible results on the basis of their actual experience.

THE BASIC PLAN OF THE INVESTIGATION.

The so-called law of average being the bedrock foundation of all sound forms of insurance, and the literature of alcohol and alcoholism apparently indicating that there are almost as many distinct positions as commentators on these subjects, the possibility—not to say the eminent desirability—of in some way averaging the data collected from the medical directors who might be pressed into service in the proposed investigation naturally suggested itself. In the home offices of all well-run life and accident insurance companies carefully compiled records of the causes of policy holders' deaths are kept and interesting tabulations of these records for long stretches of years have been published by some of the larger companies, but in no insurance office, so far as I am aware, are the contributory causes of death systematically recorded. In default of actual records of deaths in the case of which alcohol figured only as a minor factor, of course it would have been impossible for medical directors to furnish the number of deaths directly or indirectly caused by alcohol in the case of their respective companies, and evidently the nearest approach to exact figures at their hands would be in the nature of estimates based on their singularly broad experience in passing on applications and death claims.

It was instantly apparent that the more numerous and the more sharply differentiated the classes on which the estimates were based the more accurate would probably be the final results of these estimates—and the more numerous the available checks on those results. I therefore conceived the idea of calling upon each medical director who might participate in the investigation for his personal, independent estimate of the percentage of male deaths at adult ages directly or indirectly due to alcohol in the case of each of the nominal causes of adult male deaths in which alcohol could possibly have figured to any appreciable extent. The plan so mapped out provided for applying to the total number of male deaths at adult ages in the case of each of these causes the average of the percentage estimates obtained from the medical directors for that cause of death, thus working out the presumptive number of adult male deaths from that nominal cause in which alcohol really figured, and then by the addition of these totals arriving at a tangible approximation of the total adult male mortality in which alcohol was a factor in the registration area of the United States for which specific mortality figures for recent years were available. With this

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total as a rationally established basis, it seemed possible that at least a fairly safe approximation of the total alcoholic mortality of continental United States might be calculated.

Having thus tentatively formulated a plan for a pioneer effort at an approximation of the alcoholic mortality of the United States, I consulted Dr. Brandreth Symonds, president of the Association of Life Insurance Medical Directors of America, chief medical director of the Mutual Life Insurance Co. of New York, and for more than 20 years identified with that great company as medical examiner, assistant medical director, medical director, and chief medical director, and requested his frank opinion as to whether in his judgment the proposed plan was practicable and workable, and might be expected to produce results of real value. Dr. Symonds replied that the plan was not only new and novel, but entirely workable and well worth the trying, and that I could count on his hearty cooperation with the proposed investigation. The results of this encouraging decision on the part of so eminent a medical authority of the life insurance world were the investigation and the publications of its results under the title of "The Mortality of Alcohol" in the latter months of 1911.

Dr. Symonds having kindly consented to serve on the medical jury to which the case was to be submitted, I then enlisted the cooperation of two other medical directors of long and broad experience, namely, Dr. Eugene L. Fisk, medical director of the Postal Life Insurance Co., and Dr. William L. Gahagan, medical director of the United States Casualty Co., both of New York City, and secured from each of these three physicians his independent estimates of the percentage of male deaths at adult ages in which alcohol had probably figured as a causative or contributory factor in the case of each of 106 causes of death listed in the mortality statistics for 1908 of the Bureau of the Census, the statistics in question being the latest available when the investigation was commenced. All told, 187 causes and classes of causes of death were listed in the census report in question, but as the preliminary investigation was to be restricted to male deaths at adult ages, 81 of these causes or classes of causes were stricken out as without the scope of the investigation in the judgment of several physicians called upon to pass on the list. For similar reasons the three medical directors of whom percentage estimates were requested were asked to confine their estimates to the probability in the case of male deaths between ages 20 and 74, inclusive, their official experience not including infant or child mortality, and the consensus of medical opinion being that male deaths at age 75 or over in which alcohol appreciably figured practically constituted a negligible element.

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THE RESULTS OF THE INVESTIGATION.

In the lists of primary causes of male deaths at adult ages submitted to the three medical directors for their independent percentage estimates in each case, the 106 causes in question were broadly classified in three groups, as follows:

Group A. Twenty-eight causes of adult male deaths in which alcohol may have been an important contributory factor and sometimes the principal causative factor.

Group B. Forty-eight causes of adult male deaths in which alcohol may have been a minor contributory cause, or at least a distinctly disturbing factor.

Group C. Thirty causes of adult male deaths in which alcohol was not primary or secondary cause, but may have been a harmful contributory factor.

Without going into needless details regarding the findings in the case of each of these groups, the results of the application of the average of the percentage estimates for each separate cause of death to the total number of male deaths at adult years charged to that cause in each of the three groups may be summarized as follows:

Groups.	Total number of male deaths from these causes (ages 20 to 74, inclusive).	Number of male deaths from these causes in which alcohol figured, according to average of physicians' estimates.
Group A	73,747	18,337
Group B	107,422	13,664
Group C	17,689	852
Totals	198,858	32,853

The above figures merely state on the broadest possible lines the immediate results of the entirely independent percentage estimates of the three medical directors in the case of each of 106 causes of male deaths at adult ages in the registration area of the United States in 1908, on the basis of which was calculated a statistical approximation of the total alcoholic mortality of both sexes at adult ages in continental United States. The above group totals, of course, make no showing of the individual estimates or of the pronounced differences between the three physicians' estimates in many cases which, in my judgment, materially contribute to the credibility and reliability of the final showings as thoroughly representative of American medical opinion as to the mortality directly or indirectly due to alcohol. The opinions of equally competent physicians as to the part which alcohol plays in modern mortality materially differing, according to their several viewpoints, and the estimates on the averages of which the

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findings of this investigation are based having been made without so much as the slightest semblance of consultation in any case, it was inevitable that in some cases the estimates would widely vary. Had they not so varied they would not have been representative of American medical opinion on the subject.

It was, therefore, fortunate rather than unfortunate that one of the medical directors whose estimates figured in this investigation proved to be a physician of pronouncedly antialcoholic leanings—that is to say, one of the class of physicians who believe alcohol to be a particularly potent mortality factor. As an inevitable result of this view of alcohol's pathogenic effects, this physician's estimates were almost invariably higher than those of the two other medical directors, so that the averages of the three estimates throughout the tabulation of deaths from 106 different causes probably were fairly representative of ultraconservative, conservative, and pronouncedly antialcoholic American medical opinion. In fact, some physicians have expressed the opinion since the publication of the results of the investigation that even were a poll of two or three hundred American physicians to be made and the averages of their percentage estimates applied to the total number of deaths at adult ages in the United States, the final showings of that poll probably would not materially differ from the findings based on the averages of the three medical directors who figured in this investigation. Further proofs of the probable approximate correctness of these findings are hereinafter briefly summarized in this paper.

The tabulation of the preliminary showings above presented indicates that 32,853 of the total of 198,858 adult male deaths from the 106 causes in question were directly or indirectly due to alcohol, or, in other words, that 16.5 per cent of the total number of deaths in question were deaths in which alcohol presumably played some part. A careful comparison of the number of male and female deaths directly due to alcoholism in the registration area of the United States, and also in New York City, apparently indicating that the male mortality in which alcohol figures in this country must be at least five times as large as the female mortality of this class, and this conclusion being confirmed by every one of the physicians and registration officials to whom the matter was submitted, it seemed entirely safe to assume that the percentage of female deaths at adult ages directly or indirectly due to alcohol would not exceed one-fifth, or 20 per cent, of the male ratio. The 16.5 per cent of male deaths between ages 20 and 74, inclusive, directly or indirectly due to alcohol in the case of the 106 causes considered being found to constitute about 13.2 per cent of the total male deaths from all causes at ages 20 and upward, the female mortality in which alcohol presumably figured was consequently calculated on the basis of one-fifth of this

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percentage rate, or 2.6 per cent of the total female mortality from all causes at ages 20 and upward, and so computed the total adult alcoholic mortality of the registration area of the United States in 1908 apparently reached the total of 38,288 deaths, or 8.4 per cent of the total mortality from all causes at ages 20 and upward.

The presumptive adult mortality of the registration area in which alcohol figured as a factor in 1908 having been approximately computed, it only remained to apply the percentage figures thus worked out to the estimated population of the remainder of the country, with the adjustment necessary for adapting them to the much larger rural population of the nonregistration area, in order to arrive at a statistical approximation of the total mortality of continental United States in which alcohol presumably figured as a causative or contributory factor. Making the necessary allowances for the estimated rural and urban populations of the nonregistration area and the supposedly resultant mortality rates of that area, the computation of the alcoholic mortality of the entire country, worked out on the lines hereinbefore summarized with the averages of the three medical directors' estimates as a basis, fixed the mortality of the United States in 1908 in which alcohol appreciably figured as a factor at 65,897, or in round figures 66,000, this total being about 5.1 per cent of the supposed total mortality of the country from all causes at all ages, or 7.7 per cent of the total mortality from all causes at ages 20 and upward. Otherwise stated, this figure indicates that alcohol might be supposed to play some part in about 1 in every 20 deaths at all ages, or in about 1 in every 13 deaths at adult ages (ages 20 and upward). As is stated in the conclusions presented in my book (p. 73), "it should be clearly understood that this figure by no means signifies that alcohol was the direct cause of 66,000 deaths, the number in question presumably including all of the deaths in which alcohol played any appreciable contributory part. Consequently the number of deaths thus computed is not properly comparable with the number of deaths accredited to any particular cause in the annual mortality statistics of the registration area, as in every case those figures deal with deaths immediately due to the cause named."

THE RESULTS MEASURED BY OTHER STANDARDS.

According to Capt. Richmond P. Hobson's widely advertised congressional speech and subsequent booklet on "The Great Destroyer," alcohol is responsible for more than 680,000 deaths, or approximately one-half of all deaths from all causes at all ages in continental United States. According to the results of this pioneer investigation of the subject in the United States, alcohol is responsible, directly or indirectly, for not more than 66,000 deaths, or approximately

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one-twentieth of all deaths from all causes at all ages in continental United States. Both figures are but approximations, but the discrepancy between them is somewhat pronounced. Which of them is apparently more firmly grounded and entitled to more serious consideration? The discussion of the results of my investigation in medical, temperance, and lay periodicals stretching out over very nearly 12 months has failed to bring to light any semblance of a previous investigation of the probable mortality from alcohol in the United States, and it would seem safe to assume that there had been no such previous investigation. There apparently being no prior data on these lines available, the presumptive accuracy or inaccuracy of the conclusions of this investigation, as contrasted with Capt. Hobson's tenfold assumptions, can only be measured by a comparison of the methods by which the two estimates—almost as far apart as the poles—were arrived at, by a checking up with the best foreign data obtainable, and in the light of the most competent, unbiased, American opinion.

The processes of my approximation of 66,000 deaths in the United States in 1908 in which alcohol may have figured as a causative or contributory factor, based on the average of the independent estimates for each of 106 causes of death by the medical directors of three large American insurance companies, have already been sufficiently outlined. Now, as to Capt. Hobson's own statement of the methods by which he arrived at his conclusion that the number of deaths in this class should be fixed at "over 680,000 deaths per year in continental United States." On pages 4 and 5 of the reprint of his lecture on "The Great Destroyer" I find this explanation of the faith that is in him:

> It is difficult to say in any particular case whether having alcohol in the system caused a patient to take a disease or caused a patient to die, and alcoholism attributed to men who die in delirium tremens is the only record of death ordinarily kept against alcohol. But the British Government, in conjunction with English life insurance companies, from the records of millions of cases, has been able to determine the death rate of total abstainers and of those who drink.
>
> Statistics compiled by insurance companies show that the death rate for the population at large is 1,000 deaths per year out of every 61,215 of the population, and that the death rate of total abstainers is 560 per year out of the same number, and for liquor dealers 1,642 deaths per year out of the same number. These figures, resulting from many millions of cases, can be taken as accurate. They show that 440 deaths out of every 1,000 deaths, nearly one-half of the deaths that occur, are due to alcohol. Applied to this country, over 680,000 deaths per year in continental United States or over 725,000 per year in the United States and its possessions. In other words, alcohol is killing our people at the rate of nearly 2,000 men a day every day in the year.

On the strength of nearly 20 years' experience in the conduct of an insurance magazine, and a fairly comprehensive acquaintance with

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the records and literature of life insurance, I confidently challenge this statement that "the British Government, in conjunction with English life insurance companies, from the records of millions of cases, has been able to determine the death rate of total abstainers and of those who drink." If the British Government ever has undertaken any such task, it has completely escaped my attention, and I should be very glad to have the date and title of the official record of any such investigation, and the page on which the alleged results as stated by Capt. Hobson are presented. That the bare figures quoted by him were presented in a British "Bluebook" I am well aware, now having before me the three ponderous volumes of the Report of the Inter-Departmental Committee on Physical Deterioration (Cd. 2175, Cd. 2186, and Cd. 2210), published in 1904, in which they appeared, but I therein find positive evidence that Capt. Hobson has entirely misunderstood, and misquoted, the figures in question, which he characterizes as "statistics compiled by insurance companies." In the first place, life insurance companies do not bother with "the death rate for the population at large," their mortality compilations practically being confined to their own respective mortality experiences. In the second place, the figures cited by Capt. Hobson, and incorrectly cited, were not compiled or presented by the British Government, but were presented as an appendix to the evidence of a Mr. W. McAdam Eccles and a Dr. Robert Jones before the inter-departmental committee. In the third place, as will be seen by reference to page 64 of Volume III of the committee's report, the figures as presented in this appendix actually conveyed a very different meaning from that attributed to them by Capt. Hobson, reading in the report as follows:

COMPARATIVE MORTALITY OF ADULT MALES, PUBLICANS, AND ABSTAINERS.

The registrar general has ascertained that of 61,215 men between 25 and 65 in the community, 1,000 die in one year; but of 61,215 publicans, 1,642 die in one year; but of 61,215 Rechabites (abstainers), 560 die in one year.

The figures for the death rates of "men between 25 and 65 in the community" and for publicans between those ages, I find on pages ix–x of Dr. John Tatham's letter to the registrar general in the Supplement to the Fifty-fifth Annual Report of that official, published in 1897 (C. 8503), but the death rate for Rechabites (abstainers) alleged as above apparently is not included in that voluminous report, and presumably was cited from other sources. Not only are the figures quoted from Dr. Tatham's letter to the registrar general those for the years 1890, 1891, and 1892—or, in other words, 20 years old—but they afford no measure whatsoever of the mortality of alcohol, merely tracing the comparative mortality of publicans between ages 25 and 65 and the general male community between those

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ages. Even should the death rate cited for Rechabites (abstainers)—the authority for which is not mentioned—have rested on sufficient experience and been so carefully worked out as to entitle it to serious consideration, the comparison of such a death rate among a carefully selected class of men between ages 25 and 65 and the death rate among the general male community at those ages would be equally valueless as a means of measuring the relative mortality of abstainers and nonabstainers, the one presumably being a select class of insurable risks—and, incidentally, total abstainers—and the other, the general run of the male community, including men of all classes, both drinkers and nondrinkers.

As a matter of course, the death rate of a selected, insurable, body of men in any age group might be expected to be materially lower than that of the entire male community in that age group, and consequently Capt. Hobson's novel method of undertaking to measure the mortality properly chargeable to alcohol by subtracting from the death rate of the adult male community at large the alleged death rate of a select, insurable, body of abstainers of like age, and then announcing the difference as the alcoholic death rate, is not only unique but utterly valueless. So computed, his assertion that alcohol is responsible for "over 680,000 deaths per year in continental United States" obviously falls of its own weight, as previously stated. Were it not for the fact that the figure in question was the only specific figure at which the mortality from alcohol in the United States had been fixed in any quarter prior to my recent investigation, and that it had been widely quoted, it would scarcely have been worthy of the actual demonstration of its absurdity on the strength of official records with which I have dignified it.

The ridiculous figure of 680,000 deaths from alcohol per annum in the United States disposed of, the approximation of about 66,000 deaths arrived at as the result of the recent investigation would seem to be entitled to serious consideration as a starting point for further investigations, if fairly comparable with the results of the English investigations of many years since, and the official figures for the towns of Switzerland previously mentioned in this paper, no other standards of comparison apparently being available. At least, such would seem to be the case, unless some tangible, unanswerable arguments against the tentative acceptance of this figure in default of more exact data were to be brought forward. Up to date, to the best of my knowledge, no such arguments have been advanced, the leading medical journals of this country in their review of the published results of the investigation having practically concurred in the conclusion that the final approximation of 66,000 deaths directly or indirectly due to alcohol was presumably not far away from the actual figure. In so far as the three English investigations of the

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subject are concerned, but one of them, to wit, that conducted by the Harveian Society of London in 1879–1882, was laid out on such lines as to permit of any comparison of its results with those of my investigation.

As read before the Harveian Society November 16, 1882, and published in the British Medical Journal of January 20, 1883 (Vol. I for 1883, p. 97 *et seq.*), the report of the English investigation in question dealt with returns for 10,000 deaths in the city of London collected from London physicians, and showed that 1,402 deaths, or almost exactly 14 per cent, of the total of 10,000 deaths apparently had been accelerated or partly caused by the abuse of alcohol, or were wholly due to it. About 75 per cent of the returns in question had come from private practitioners, and the remaining 25 per cent from workhouse infirmaries, lunatic asylums, hospitals, and inquest reports, and all, it will be remembered, dealt with London mortality. My investigation, on entirely different lines, showed an apparent mortality of about 7.7 per cent of the total mortality of the United States at adult ages in 1908, as contrasted with the Harveian Society's showing of a mortality of 14 per cent at adult ages in the city of London in or about 1880. Taking into account the pronounced differences in the periods and fields of the two investigations, how do their findings compare, or, in other words, is the discrepancy in the findings greater than might have naturally been expected? I venture to believe that it is not, and for these reasons:

The English investigation not only dealt with the mortality conditions of a generation ago, but solely with urban mortality, and with the urban mortality of the greatest city in the world. About one-quarter of its figures came from infirmaries, asylums, hospitals, etc.

In the 28 years intervening between 1880 and 1908 the corrected death rate of England and Wales decreased from 19.5 to 14.7, or by all but 25 per cent, and even assuming that the Harveian Society's figure of 14 per cent of the total adult mortality of London was also a fair measure of the alcoholic mortality of England and Wales in 1880, it would obviously be unfair to compare the supposed alcoholic mortality of the United States in 1908 with that of England and Wales 28 years earlier. As a well-known matter of fact, in both countries the rural mortality is always much lower than the mortality of the cities, and it would seem fairly assumable that whatever the alcoholic mortality rate of the great city of London might be, the alcoholic mortality rate of the entire United States, with approximately two-thirds rural population, would be materially lower.

Furthermore, Mulhall's statistics show that the per capita consumption of alcohol in the United Kingdom in 1871–1880 was 2.10 gallons as against a per capita consumption of 1.14 gallons in the United States in 1880, and the figures of the Board of Trade of

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Great Britain and Ireland for 1900 charge the United Kingdom with a per capita consumption of absolute alcohol of 2.08 gallons, as compared with one of 1 gallon for the United States. All these facts would forecast a much lower alcoholic death rate in the United States, as a whole, in 1908 than in London in 1880, and the materially greater amount of female drinking in London than in this country, and the materially greater percentage of known female mortality directly chargeable to alcohol would be certain to make the London alcoholic death rate much higher. In fact, where the ratio of 55.26 female deaths for each 100 male deaths in which alcohol figured, as shown by the Harveian Society's London investigation, applied to the known figures for the registration area's total adult mortality considered in my investigation, the deaths of both sexes at adult ages directly or indirectly due to alcohol would have amounted to 11.2 per cent of the total adult mortality, as compared with the Harveian Society's figure of 14 per cent for London in 1880.

In short, taking into account only the more important differences in the conditions governing the two investigations, it would seem that the difference between the Harveian Society's measure of the alcoholic mortality of the city of London in 1880 as 14 per cent of the total adult mortality, and my approximation of the alcoholic mortality of this entire country in 1908 as 7.7 per cent of the total adult mortality was no greater than might have been expected. The records for the leading towns of Switzerland in 1900–1903 suggest that 10.3 per cent of the deaths among adult males were in whole or part due to alcohol, and that 1.9 per cent of the deaths among adult females were so due, and taken either separately or jointly these figures do not materially differ from the showings of this investigation for the United States—the Swiss ratio of female to male deaths, or 1.9 to 10.3, being almost identical with my assumption of a ratio of 1 to 5. In conclusion it may be truthfully said, I think, that there is nothing in the English figures of 30 years ago or the Swiss figures of recent years to raise any serious question as to the probable approximate accuracy of the results of this recent investigation in this country.

A SUPPLEMENTAL CONFIRMATION OF THE FINDINGS.

An entirely unexpected and exceptionally valuable confirmation of the general showings of my investigation was forthcoming about three months ago in the form of a personal letter and attached tabulation sent to me by my esteemed friend, Dr. Cressy L. Wilbur, chief statistician of the Division of Vital Statistics, Bureau of the Census. Under date of June 26 last Dr. Wilbur wrote me that he had just finished reading my book on "The Mortality of Alcohol," and added:

> It may interest you to see some estimates that I made myself before examining the averages or individual opinions (of the three medical directors on

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whose percentage estimates the findings of the investigations were based). Subsequently I added in red ink the averages, so that you can conveniently compare them with my offhand estimates. Of course, I look at it from a somewhat different point of view, regarding not merely the form of the term and its medical significance, but the kind of cases that were included under such term in the course of the practical compilation of causes of death. Nevertheless, on the whole, I think there is a very remarkable correspondence, and I should, of course, be disposed to modify certain percentages of my own to correspond with the general consensus of opinion.

The tabulation attached to Dr. Wilbur's letter bore at its head a note to the effect that "the estimates below were made before examining the tables (before even turning over the pages on which they appear or reading the headings or any part thereof) and are therefore entirely uninfluenced by the ratings given therein." Then followed his entirely independent percentage estimates for each cause of death, and, as stated in his letter, the average percentage in each case as presented in the tables in my book was subsequently added in red ink. A bird's-eye view of the surprising concurrence, in the main, of Dr. Wilbur's estimates, with the averages of the three medical directors' estimates, is presented in the following tabulation of the figures for all causes of death to which my investigation charged as many as 500 male deaths between ages 20 and 74, inclusive, in the registration area of the United States in 1908:

Causes of death.	Total male deaths between ages 20 to 74, inclusive, from these causes, in registration area of the United States in 1908.	Male deaths from these causes, between ages 20 to 74, inclusive, apparently due in whole or part to alcohol.			
		According to averages of medical directors' estimates.		According to the estimates of Dr. Wilbur.	
		Per cent.	Number.	Per cent.	Number.
Bright's disease	17,513	30	5,254	40	7,005
Tuberculosis of lungs	33,900	12	4,068	10	3,390
Heart disease	22,887	16	3,662	20	4,577
Pneumonia (lobar and unqualified)	14,044	22	3,090	10	1,404
Cirrhosis of liver	4,123	67	2,762	75	3,092
Apoplexy	11,748	22	2,585	30	3,524
Alcoholism	2,025	100	2,025	100	2,025
Suicide	6,035	23	1,388	20	1,207
Diseases of arteries	2,803	23	645	40	1,121
Other accidental injuries	5,163	10	516	5	258
Paralysis	2,329	22	512	25	583
Totals	122,570	21.6	26,507	23	28,185

The difference of 1,678 deaths between the book totals and Dr. Wilbur's totals for the 11 more important causes of death above listed amounts to 6.33 per cent, and, making allowance for certain minor causes of death which Dr. Wilbur has included in his percentage estimates but which were not included in the medical directors' estimates, the total number of adult deaths in continental United States in 1908 in which alcohol presumably played some part

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according to Dr. Wilbur's estimates, would have been about 71,600, as compared with the approximation of about 66,000, suggested by the report of my investigation. This difference, in other words, would have been one of less than 9 per cent of the total tentatively fixed on the basis of the three medical directors' estimates, or considerably less than 1 per cent of the presumptive total mortality at age 20 and upward in the United States in 1908. It would seem that Dr. Wilbur's statement in his letter to the effect that "on the whole, I think there is a very remarkable correspondence," was an entirely justifiable summary of the comparison of the two sets of estimates so entirely independent and made on such radically different bases. Of course, Dr. Wilbur's estimates were in no sense official, but were made in his purely personal capacity, but coming from such an expert source they seem to me to shed a flood of light on the probable approximate accuracy of the results of my investigation, and I have been more than glad to present them in connection with this paper, with Dr. Wilbur's express permission.

As stated in the introduction to my book, "At best, however, the results of any such inquiry can be but an approximation, and, as a matter of course, any one of the estimates or numerical conclusions presented in the tables accompanying this paper is fairly open to competent analysis and discussion. If it can be proven incorrect, the sooner it is disproved the better."

THE RELATION OF ALCOHOL TO INDUSTRIAL ACCIDENTS AND TO OCCUPATIONAL DISEASES.

WILLIAM F. BOOS, M. D., Boston, Mass.

When I began to study the part played by alcohol in the production of industrial accidents I turned to the Interstate Commerce Commission for information. It appeared, however, that the reports received by the Commission tell the immediate cause of accidents only, and not the indirect or remote cause. Thus a railway accident, for example, will have "carelessness" given as the cause of the accident, and there will be no indication in the report to the Commission that this carelessness may have been due to alcoholism.

Having failed to obtain any data from the Interstate Commerce Commission, I applied to the large casualty insurance companies for facts on alcohol, hoping to obtain material from their records. Here again I was told that there was no material available. The life insurance companies gave the same answer.

Meanwhile I had sent some two hundred or more letters to manufacturing concerns of all kinds, employing male labor. I received many replies to my letters and was assured by many of the writers

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of interest and any possible cooperation in my endeavors, but none of the firms addressed was in a position to give me any figures.

Some of the points which were emphasized in many of the letters are interesting. A large number of the writers said that they do not employ men who drink, if they know it. Others again made the assertion that accidents are usually due to carelessness and not to drunkenness. Many letters said, "Our house requires men to be strictly sober when they report for work," without, however, giving the method used to determine that a man is "strictly sober."

All the writers were confident of the superiority of abstainers over workmen who use liquor; and some went so far as to say that the efficiency of the men who use liquor is not over 50 per cent of that of the abstinent workmen. It was claimed by many writers that drinkers are not steady workers even when they are skilled men. One firm of shoe manufacturers said that when they employed drinking men, many more shoes were returned to the factory for inferior work than at present, when the drinking men have been weeded out as far as possible, and another shoe manufacturer said that he turned out better shoes and many more of them under no license than with license.

One manufacturer emphasized the fact that much time is lost by drinking men and that their absence causes a loss to other employees who must wait for work. In the experience of this manufacturer, if a pay day fell on Friday or Monday 20 to 30 men failed to report for work the next day.

The letters from the manufacturers contained many other suggestive points, but there was nothing in the letters which had any direct bearing on the subject of this inquiry, and having with these letters exhausted, as it seemed to me, the possible sources of information in this country, I turned to European sources for actual figures.

The officers of the mutual benefit societies of Germany have done considerable work on the problem in hand, and their figures are very telling.

Hollitscher [1] finds that alcoholic workmen between the ages of 25 and 44 have three times as many accidents resulting in injuries as all the workmen put together, and that the days of illness resulting from such injuries are nearly four times the number incurred by all the workmen.

As a result of other German studies [2] it was determined that if the accidents caused by the use of alcohol could be eliminated, 7 per cent of all accidents would be prevented, and the saving to the German mutual sick benefit societies for the year 1897, alone, would have been $1,800,000.

Employers of labor and students of the alcohol problem in America say that this estimate is ridiculously low, one manufacturer, whom I consulted, going so far as to say that in his estimation fully one-half

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to two-thirds of all industrial accidents are due to the influence of alcohol. This estimate seems radical, but when the effect of the long-continued use of alcohol on the nervous system, even without periods of actual intoxication, is considered, the estimate may appear in a different light.

Most industrial houses confine their efforts to the prohibition of intoxication or the use of alcohol during working hours. They have, however, no effective method to control surreptitious drinking up to the point of actual intoxication. When a workman has taken enough to become intoxicated, this fact is immediately self-evident, and the offender is promptly ejected. Gross intoxication may therefore even act in a measure as a safeguard against accidents. But the damage may have been done long before the man is really drunk. If, on the other hand, he is an habitual drinker who never gets drunk, he forms a source of constant danger to himself and to his fellows.

The types of alcoholism which are not signalized by intoxication are the most serious as predisposing causes to accidents. There are two such types; they include, first, the week-end drinker, and, second, the habitual daily drinker, referred to above. The latter is often described as the moderate drinker, and this simply because he does not get drunk.

Week-end drinkers figure prominently in the accidents which occur on Mondays, or, in general, the day following a holiday, when accidents are much more common than on the other days of the week.

Monday accidents result from the paralyzing effect of a Saturday night and Sunday debauch, the "hang over" from which may last for from 24 to 48 hours. The victim of the "hang over" appears normal to the casual observer; he is not, however, in complete control of his faculties, and he is therefore much more liable to have an accident.

A study of the industrial accidents occurring in Zurich, during the years 1900 to 1906, inclusive,[3] shows that the average for accidents on the other week days except Monday is 15.7 per cent, while the average for Monday is 22.1 per cent.

The habitual daily drinker is perhaps the greatest source of danger, for although the quantities of alcohol he takes each day may not suffice to produce intoxication, they suffice, nevertheless, considerably to reduce his alertness.

Drinkers of this class suffer loss of acuteness of hearing[4] and of vision;[5] in fact, all their mental processes are retarded (experiments of Joss, Smith, Kraepelin, Aschaffenburg). Consequently these men are less careful and accurate in their work, and are also slower to perceive or appreciate danger. In some of these cases the daily use of alcohol leads to color blindness.[6] It is hardly necessary to emphasize the importance of this fact in its relation to railway employees.

The impairment of the mental and physical faculties produced by the habitual use of alcohol is due, as I have stated, to a "hang over"

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or paralyzing effect, which may continue, after a debauch, for from 24 to 48 hours. With the continuous daily use of larger quantities of alcohol a permanent impairment and destruction of vital tissues in the central nervous system takes place. This impairment is progressive and it renders the individual of necessity less and less responsible as a workman.

The continued use of alcohol also retards tissue repair after injuries,[6,7] and much time and money are lost in this way by both the workman and the employer. Injuries received by habitual drinkers are furthermore very likely to call forth an attack of delirium tremens which may seriously threaten the life of the victim.

The tendency of habitual users of alcohol to incur accidents is well shown by the investigation of Guttstadt,[8] who studied the statistics of accidents among the various trades of Prussia for the period 1897 to 1901, inclusive. He found that while the number of accidents per thousand among all trades was 43, the brewery trade showed an average of 109 accidents per thousand. In Upper Silesia, a center for the dangerous steel industry, it was found that the number of accidents per thousand in 1901 for the steel trade was 90.1, while that for the brewery trade in the same district was 118.6.

From the employer's point of view alcohol, as a predisposing cause of accidents and of sickness among workmen, threatens to become an economic issue of the greatest importance, because all the States of the Union will eventually be obliged to pass legislative acts similar to the Workingmen's Compensation Act, which went into effect in Massachusetts on July 1, 1912.

This Act forces employers to compensate employees for injuries or losses due to any and all accidents occurring during working hours. Heretofore a workman could recover from his employer for such accidents only as were due to negligence on the part of the employer or any of his servants for whom he was directly responsible; now the workman in Massachusetts may recover, no matter if the accident was due to his own carelessness or to that of some other employee.

The Act is so serious and far-reaching in its scope and of such importance in its relation to the liquor problem that it may not be amiss quickly to review the economic results of similar legislation in the countries where it has been in force for years.

In the eighties of last century, William I of Germany (grandfather of the present Emperor) became convinced that the conditions in the factories of Germany were intolerable, and he suggested to Bismarck that the Government, through a commission, investigate the factory situation throughout the Empire, and more particularly the conditions of life among the workers in the factories.

As a result of the first report a sick benefit insurance was arranged, which was to cover a period of two weeks. But this was soon found

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to be merely a trifle; the situation confronting the investigators was so serious, on account of the hardships through the maiming of workmen and through fatal accidents, that a more lasting and more substantial form of protection became imperative.

A system amounting to an industrial tax was therefore arranged, and the present law, which is socialistic in its nature, became fully established about the year 1885. Since then the law has been adopted all over Europe, even in Russia. In Austria, where each of the different principalities is obliged to have its own system under the general supervision of the imperial Government, the premiums which have been assessed have proved entirely inadequate; so much so, in fact, that to-day the several Austrian societies are all practically bankrupt with an estimated deficit of $18,000,000. They are now trying to have the Imperial Government finance this deficit.

In England the condition of the companies writing compensation insurance indicates that in a few years they will be in the same condition as the Austrian companies, unless they advance their rates considerably.

The purpose of the law is to safeguard life, and some such law has of course, been a long-felt necessity from the workman's point of view, but the cost of compensation insurance in Massachusetts is so high that some of the largest employers of labor can not afford to buy, it; and without insurance it would not require a very large number of accidents, due to intemperance on the part of the employees, to completely ruin a large concern. Then, too, the law, in its present form, classes all employers of labor on the same footing—that is to say, it makes no distinction between the employer who has always sought intelligently and humanely to safeguard the welfare of his employees and the one who in the past has entirely disregarded all measures for the life and health of his workers. One large watch manufactory offers an example of the injustice of the present law.

The factory in question is in its equipment in every respect a model of sanitation and protection. Among other things, the company maintains its own dormitories for the women workers, so as to give them the best of home influence. When an accident occurs, which is rarely, all hospital expenses are defrayed in full by the company, and full compensation is allowed during the period of injury. In other words, this manufacturing house has already accomplished what it is hoped this law will accomplish for the general working public in a period of years.

Now consider, on the other hand, the careless employer with a risk which has proved so hazardous in the past that no stock company will accept the risk. To obtain compensation insurance this employer joins the Massachusetts Employees' Insurance Association, an

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organization provided for by the law, which organization is compelled to admit him to membership. But this membership is mutual with that of the careful and safeguarding house referred to above. The latter is therefore obliged to share with the irresponsible employer the burden of his carelessness.

Such a condition can not last. Eventually the State will be compelled to assume the burden of compensation insurance and the various industries will have to bear the cost of compensation insurance according not only to the hazard of the class to which they belong, but also according to the conditions which govern the morale and the care of their employees. In time this will make the cost of compensation insurance so high that it will become necessary for employers to eliminate absolutely the use of alcohol and drugs among the employees.

A simple example will make the matter clearer. Let us assume that a certain manufacturer employs 100 persons. He requires each applicant to fill out a blank giving his history for the past five years, including questions concerning nationality, height, weight, physical condition, and habits. The question "Do you use intoxicating liquors?" has for years been one of the questions asked of the would-be employee, showing that the use of liquor has always been recognized as a great defect in the workman.

Now, let us assume that the employer is satisfied with a negative answer to the liquor question and employs a week-end drinker without knowing it. Assume further that he places him in charge of an elevator and that the new employee reports for work on Monday morning in an apparently normal physical and mental state, when, as a matter of fact, he is the victim of an alcoholic "hang over," which causes him to be killed while he is running the elevator.

The maximum compensation which his heirs can collect in Massachusetts is $3,000. This sum would probably suffice to pay the total premium of the employer for the seven years which must elapse before the claim is satisfied. Now, with habitual and week-end drinking among employees as common as it is to-day, the constant risk of financial loss from accidents is very great, especially in the more dangerous trades, and it will soon be impossible for even the strongest companies writing compensation insurance to meet the issue at the present rates of insurance. But a rate which will adequately meet the risk in each instance will be prohibitive for the ordinary manufacturer.

From the foregoing I think it will appear that the compensation laws, working considerable hardship to the manufacturers at first, will in time act as the most potent factor in the fight against alcoholism among the working class. The employment of men who use liquor will become too much of a risk for any employer and the latter will therefore be obliged to make most searching inquiries into the past history of applicants for work. A single debauch may jeopardize

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the chances for work or advancement and parents will soon learn that a strictly temperate life must be insisted upon if their boys are to have employment at all, not to speak of success in the chosen trade.

Our present-day indifference to life is truly appalling. We have actually come to look upon the numerous industrial and railroad accidents as unavoidable, and, if perchance we are shown that some particular accident was caused directly by alcoholism, we deplore the fact, fondly hope that such a thing will not occur again, and—do nothing.

On July 4, 1912, an accident occurred on the Lackawanna Railroad in which many lives were lost. The seriousness of this accident does not lie so much in the loss of 39 lives, because an engineer may have been intoxicated, as in the fact that it was possible for an engineer who may have taken liquor to enter his cab.

What we need first of all for the safety of the public at large is a thorough control of all railway employees. The first step in this direction has been taken by the management of the elevated and underground railways of Berlin, which employs careful and responsible officials to whom all the men must report before they go on duty. This is progress, but in view of the fact that the victim of a "hang over" may be able to pass a superficial inspection it would be well to equip the officials with the necessary knowledge and apparatus to make a few quick but searching psychological tests, such tests to be used especially for engineers, switchmen, and train dispatchers.

A system of inspection and psychological examination similar to the one I have suggested should, moreover, be introduced into all the trades in which workmen are constantly exposed to the dangers of machinery in motion, or in which they have to deal with poisonous or explosive materials.

The use of alcohol on the part of the workman presents an aggravating cause to diseases often associated with certain trades. This is particularly true of the trades which bring the workman into close contact with lead and its compounds, Oliver[9] and Hill[10] having shown that the use of alcohol renders the organism more sensitive to lead poisoning.

Alcohol is one of the common predisposing causes to tuberculosis; its use is therefore especially dangerous to workers whose trade exposes them to stone, coal, or steel dust, as these trades seem in themselves to predispose workmen to pulmonary diseases.

The heavy drinking of men connected in any way with the production and distribution of alcoholic beverages is well known. Theoretically, therefore, workmen of this class should show a high death rate from consumption. As a matter of fact, one German authority[11] finds that the men who work in the brewery and distilling trades show a death rate from tuberculosis which is nearly twice as great as that of the average among the other trades, excepting only the

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restaurant business, which in Germany is uniformly one of the liquor trades.

Other trades that show a high death rate from tuberculosis are those of the laborer, roofer, coachman, and teamster. The high death rate from consumption in these four trades, which in themselves are most healthful, on account of the out-door nature of the employment, is likewise accounted for by the notorious drinking habits of the men in these occupations.

While the restaurant business in Germany is, as I have said, truly one of the liquor trades, the restaurant business in the United States has for the most part nothing to do with the distribution of liquor, and the height of the ridiculous is reached when boarding-house keepers are classed with hotel keepers, saloon keepers, and bartenders for statistical purposes. That, however, is just what the United States Census Bureau has done in collecting its statistics for 1908.[12] But in spite of the fact that restaurant and boarding-house keepers are classed with the liquor and hotel trades, this class leads all others in its death rate from cirrhosis of the liver.

Alcoholism itself may be looked upon as an occupational disease, and it is interesting to note in this connection that the statistics of the Prudential Life Insurance Co., shown at the present congress, give the saloon keepers and bartenders a death rate from alcoholism which is from three to five times as great as that of all the other trades.

An occupational disease of great interest is heart disease, as it is found associated with the liquor trades in Germany. Studying the occurrence of heart disease as associated with the various trades during the years 1884 to 1903, inclusive, Firks[13] found that the death rate from heart disease in all trades between the ages of 15 and 20 was 27.2 per thousand, while in the liquor trades it was 69.2. Between the ages of 20 and 25 it was 18.7 for all trades and 51.5 for the liquor trades. Between 25 and 30 it was 17.4 for all trades and 52.4 for the liquor trades. Between the ages of 30 and 40 it was 20.8 for all trades and 78.3 for the liquor trades.

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[1] Hollitscher, Intern. Monatsschr. z. Erforsch. d. Alkoholismus, etc., Vol. XX, p. 242.

[2] Deutsch. Intern. Monatsschr. z. Erforsch. d. Alkoholismus, Vol. XIX, p. 175.

[3] Zuerich, Statistics of the Building Trades, Annual Reports 1900 to 1906 inclusive.

[4] D'Archambault, "Des dangers de l'alcoolism," Tours, 1899.

[5] Carra, France médicale, déc. 15, 1899.

[6] Maussire, "Alcool et traumatism," thèse pour le doctorat en médicine, Paris, 1901, p. 94.

[7] Verneuil, "Mémoires de chirurgie," Vol. III, Paris, 1883.

[8] Guttstadt, Schweizer Abstinenzblatt, Vol. VI, 1907.

[9] Oliver, British J. of Inebr., Vol. IX, p. 135.

[10] Hill, J. of the Royal Inst. of Public Health, Vol. XVII, p. 726, 1909.

[11] Hollitscher, Intern. Monatsschr. z. Erforsch. d. Alkohol., Vol. XX, p. 278.

[12] U. S. Bureau of Labor, Bul. No. 27, Vol. XX (1911).

[13] Firks, Zeitschr. d. Kgl. Stat. Bur., 1907.

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DISCUSSION.

Dr. CRESSY L. WILBUR: I trust no special importance will be attached to the mere casual guess made by me as to the possible influence of alcohol as a factor, direct or indirect, upon the mortality registered from the various causes of death given in the International List. The question is a very broad one and it is hardly possible to define, with any exact significance, just what part alcohol plays as a contributory factor of disease. The information can not be gained by an analysis of the death certificates, because very frequently the physician neglects or refuses to make the statement of alcoholism as a primary or contributory cause, or the relation of the use of alcohol to the cause of death may be so indirect and remote that he may justly consider that it is not entitled to be given upon the certificate of death. Such estimates as to the possible influence have no title to be considered as statistics, but are simply individual opinions. I would rather deprecate, therefore, any reference to my own, at least, as a serious "estimate," which I had no intention of making, or the claim that its accordance with other estimates of like character amounted at all to "strong confirmation" of the conclusions. I am interested in such ratings on account of their possible relation to the disposition of joint causes of death, but certainly, without a far more extensive basis and one supported by special investigation in particular cases, the results have no claim to consideration as statistics.

EUGENE L. FISK, M. D., Medical Director Postal Life Insurance Co., New York, N. Y.: Mr. Phelps has done admirable work with the material he has employed. The insufficiency lies in the material. The wide divergence of opinion regarding the influence of alcohol on mortality is mainly due to a failure to weigh all the evidence and weigh it in the same scales. For example: One man will deliver an opinion based wholly upon laboratory evidence; another, who would not dispute the laboratory findings if he were to focus his attention upon them, will consider the matter wholly from a clinical standpoint, and disregard alcohol as a factor in the causation of death, except in cases where positive intemperance is shown. Such men adopt the "stand-pat" view that "there is no scientific evidence that moderate drinking shortens life," and their judgment is based upon scattered observation of so-called "moderate drinkers," who go about their business seemingly unaffected by their indulgence. Whether deaths among these "moderate drinkers" from typhoid, pneumonia, and even accident may not in part be due to alcohol is left unconsidered.

What we really mean, or should mean, by the influence of alcohol on mortality, is the extent to which its use among any large group

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of individuals will affect the mortality in such a group. The ideal way in which to measure such an influence is to compare groups that are homogeneous, except as regards the use of alcohol. If we find, as is invariably the case in analyzing large groups in insured lives, that there is a difference of at least 25 per cent in favor of the abstainers, we must then decide as to whether this difference is occasioned by a difference in temperament and type, or whether it is due to the direct and indirect effects of alcohol. The favorite view of the "stand-patter" in this matter is that the total abstainer is a type that carries a low mortality anyway, and that alcohol is a negligible factor, at least when used in moderation.

Now, if arsenic eating were as widespread as alcohol drinking, and we found upon investigation that the mortality among presumably moderate arsenic eaters was 25 per cent higher than that among abstainers from arsenic, I think there would be no hesitancy in ascribing such high mortality to arsenic. The effort to drag in by the heels any possible explanation of the low mortality among abstainers, except the absence of alcohol, is easily understood as a concession, conscious or unconscious, to tradition and custom. Alcohol is widely used by humanity; *ergo*, alcohol is a necessity, or at least a harmless indulgence within certain limits. This view is held in the face of laboratory evidence showing the impairment of mental and muscular efficiency, of coordination, and the lowering of resistance to disease toxins, as a result of the narcotic effect of even so-called "moderate" drinking. Such an influence, operating upon a group of, say, 100,000 lives, not only may, but *must* influence the mortality unfavorably. Experiences are now available in America that confirm the results reported by the British life companies that separate their abstainers from the general class. The Manufacturers' Life of Canada and the New England Mutual report results closely approximating those obtained by the British companies and those found by McClintock some years ago, in his analysis of the mortality experienced among the abstainers of the Mutual Life Insurance Co.[1] Another company, whose name I am not now at liberty to mention, has recently compared the mortality among its abstainers and non-abstainers, with results astonishingly in agreement with those of the companies I have mentioned.

This, in my judgment, is the way to approach the subject: Measure the mortality among the intemperate and moderate drinkers and the abstainers, and then interpret your results in the light of the known physiological effects of alcohol; not according to mere vague opinion, even of medical men of wide experience, whose judgments are not derived from an exact analysis of the scientific evidence.

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Mr. Phelps has rendered a very important service in grouping information relating to the mortality from diseases in which alcohol is an important factor and thus calling a halt on reckless statements in this regard. The missing quantity in his symposium is an exact quantitative expression derived from experience of the influence of alcohol upon large groups of lives. Available evidence of this character would indicate that the ratio obtained by his method of averaging opinions is too low.

[1] Indeed, the New England Mutual reports, through its medical director, Dr. Dwight, the astonishing ratio of 125 per cent of the American Experience Table among steady but so-called moderate drinkers, more than double the mortality shown by its abstainers.

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Part 1 of Volume III contains the proceedings of Section III and the proceedings of the subsection on Mental Hygiene; part 2, the proceedings of Section IV.

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